QUEERING THE CURRICULUM: CRITICAL LITERACY AND NUMERACY FOR SOCIAL JUSTICE

Summer Melody Pennell

A dissertation submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the School of Education (Culture, Curriculum, and Change).

Chapel Hill
2016

Approved by:

George Noblit

Cheryl Bolick

James Trier

Silvia Bettez

Sandra Hughes-Hassell

ABSTRACT

Summer Melody Pennell: Queering the Curriculum:
Critical Literacy and Numeracy for Social Justice
(Under the direction of George Noblit)

For this post-critical ethnography and Participatory Action Research (PAR) study I collaboratively developed and studied a middle school social justice course with students in fifth through seventh grade, called *Math for a Cause*. This study used a combination of several theoretical frameworks: social justice pedagogy, queer pedagogy, critical literacy, and critical math. Much of the research on critical literacy has focused on literacy within single disciplines, making the interdisciplinary combination of literacy with math in a social justice-focused class a unique contribution to the field. Furthermore, this is one of few queer pedagogy studies with middle school students. I created the curriculum for the twice-weekly course (which met for a ten-week trimester) with a collaborating teacher and a fellow doctoral student specializing in critical math. Students used critical literacy skills to research social justice topics, learned to 'read' numerical data like traditional print text, and created and solved their own math problems from this research. In addition to collecting student work, taking field notes, and writing reflections after each class, I conducted interviews with: a student focus group prior to the course design; four focal students twice during the course; the collaborating teacher; and a focus group with teachers at the school. I collected and transcribed audio recordings from student group work, wrote analytic memos after each of our three units, and recorded reflective conversations with my collaborator. I analyzed the data set with open and deductive coding using MaxQDA software.

Findings revealed that queering critical literacy along with math allows students to have a broader, more abstract view of knowledge and learning, which in turn allows them to engage in critical inquiry. Student learning stemmed from what I call *processing*, an enactment which incorporated dialogue, reflection, and engaged play. Through processing, three major interlocking themes emerged: *resisting the average* (learning that an 'average'—a social norm or a mathematical average— is not always best, and does not represent the full picture); *recognizing the puzzle* (learning to see the world and their own knowledge in abstract ways and to ask 'why?'); and *abandoning closure* (learning that there is no one right answer or way of solving problems). This implies that using an inquiry-based and student-led curriculum that challenges assumptions can help students embrace new concepts and engage in learning in a sophisticated manner. This study also shows that collaboration is possible, and valuable, between seemingly disparate disciplines such as math and literacy. Implications are discussed for both teacher educators and practicing educators.

This work is dedicated to “Cindy,” my former student; to my partner Susan for supporting me through this journey and providing endless moral support, study snacks and fortifying beverages; and to my parents, Dennis and Diana, and sister Tegan, for encouraging me through all my educational endeavors no matter how impractical they must seem.

ACKNOWLEDGMENTS

First and foremost, thank you to Morgan, the students of *Math for a Cause,* and The Anchor School for allowing Bryan and me to come in and try this crazy course. Nowhere else would have welcomed us with such trust and open arms. Thank you to the students who kept on processing and playing no matter what I said, as that turned out to be the most important work.

This dissertation would not be possible without the support of my friends and colleagues. My committee has been amazingly encouraging and helpful along the journey and I am grateful to all of you. Thank you to George Noblit for supporting and pushing me through the research and writing process, and helping me process my writing and feelings. Thank you to Cheryl for providing the necessary introductions to The Anchor School and your pep talks, Jim Trier for providing me with an assistantship before you knew me, Silvia Bettez for introducing me to queer pedagogy, and Sandra Hughes-Hassell for continuing to let me pick the readings for your class. All of you provided me with valuable feedback and suggestions during coursework, comps, and the dissertation.

Thank you to my supportive colleagues in the School of Education, including my collaborator Bryan Fede; the critical carpool team of Ashley Boyd, Hillary Parkhouse, and Alison LaGarry and honorary member Mandy Bean; the 'creepy' cohort including Eldrin Deas, Lauren Kendall, Omar Simpson, Nelson Brunsting, Tim Conder, Melissa Sreckovic, and Ariel Tichnor-Wagner; and Esme Rodriguez, Katy Day Malley, Jessie Cain, and Stephanie Konle. May our ugly sweater parties and happy hours continue, as long as we're all home by 9 pm.

To my extended family in North Carolina, thank you for not making me feel guilty when I missed events. Also I thank you for never making me go into detail about what I was studying

over Thanksgiving dinner- playing with my little cousins was much more enjoyable for everyone.

Without Gamelan Nyai Saraswati, my Tuesday nights would have been dull. This group kept me connected to UNC and allowed me to continue expressing my love for gamelan music and Indonesia. Gamelan is always a welcome therapy session and I enjoyed getting to know all of you.

Thank you to the Cheez-It brand of delicious snacks which sustained my writing, and the Gilmore Girls and dance movies for providing me with entertaining breaks.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

PART 1

CHAPTER 1: INTRODUCTION TO MATH FOR A CAUSE

For this study, I aimed to discover how social justice can be integrated into a middle school course at a private Quaker school called The Anchor School. I further aimed to explore how queer pedagogy, critical and digital literacies, and critical math can be used together to increase the social justice mindsets and activism of middle school students as well as improve their math and literacy skills. To carry out this exploration, I partnered with Bryan Fede, another graduate student in my cohort, who specializes in critical math and social justice. The two of us in turn collaborated with Morgan, a math teacher at The Anchor School, to create an elective course for the school's fall 2014 trimester called *Math for a Cause*. We hoped to show that social justice can be integrated into the curriculum, particularly math which is seen as a neutral subject by many (Warnick & Stemhagen, 2007). Social justice—through a lens of queer pedagogy—was the driving force of all classroom activity, and students were actively engaged in conversations with each other, and at times attempted to engage with an outside audience.

The study aimed to answer the following research questions, though in the analysis these questions were largely abandoned:

1. How does queering math for social justice promote a social justice mindset and action in students, as seen through these criterion: 1) having a critical consciousness, 2) taking action to give people from all social groups equal access to resource and opportunities, 3) acting with love and compassion, 4) providing healing and hope for all people, 5) participating in a socially engaged spirituality [the Quaker way] (Rendón, 2009)

The following secondary questions were also explored:

2. Is there evidence of queering (both in the curriculum and in student's work and conversations), as seen by: questioning norms, limits, ignorance, and reading practices, (Britzman, 1995a) and the queering of everyday moments (DePalma, 2010).
3. Are students performing acts of critical literacy, as seen through these practices: coding, text-meaning, pragmatic, and critical? (Freebody & Luke, 1990)
4. Are students using the above practices in critical math? How are these practices enabling students to: use mathematics to read the world, use mathematics as a tool to analyze social issues; and look for relationships between the social issues? (Gutstein, 2003)

Nature of the Study

The study examined how a middle school math class can incorporate social justice into their classwork. While initially we thought students would be primarily engaging in conversations online, this was not the case. We planned to ask students to respond to online articles on social justice issues, using math as a point of entry to the conversations that happen in the comments section of online news stories. For a hypothetical example, consider an article posted on Sports Illustrated's (SI) fan website in October of 2013. The headline read "Atlanta Braves fans don't respond well to GLAAD Facebook Post" (Sanchez, 2013). GLAAD is a lesbian, gay, bisexual, transgender, and queer (LGBTQ) organization, and every year in October they ask people to wear purple to show support for LGBTQ youth on a specific date, calling it a spirit day. The SI article included screen shots from the professional baseball team's Facebook page, where they encouraged fans to participate in Spirit Day. These screen shots showed where people made derogatory comments about both the team and LGBTQ issues in response. Yet when we read the comments on the SI article, someone had responded "please check out the actual comments on Facebook…there are 10X more statements of encouragement." In looking at the Atlanta Braves' Facebook page a few days after the initial post, over 4,500 people had "liked" the post about GLAAD's Spirit Day, while a similar post about breast cancer from October 19 only had 591 likes. The GLAAD post had over 1,000 comments and 550 shares; the

Stand up for Breast Cancer post only had six comments and 36 shares. It was clear that the "true" story was very different from that painted by SI.

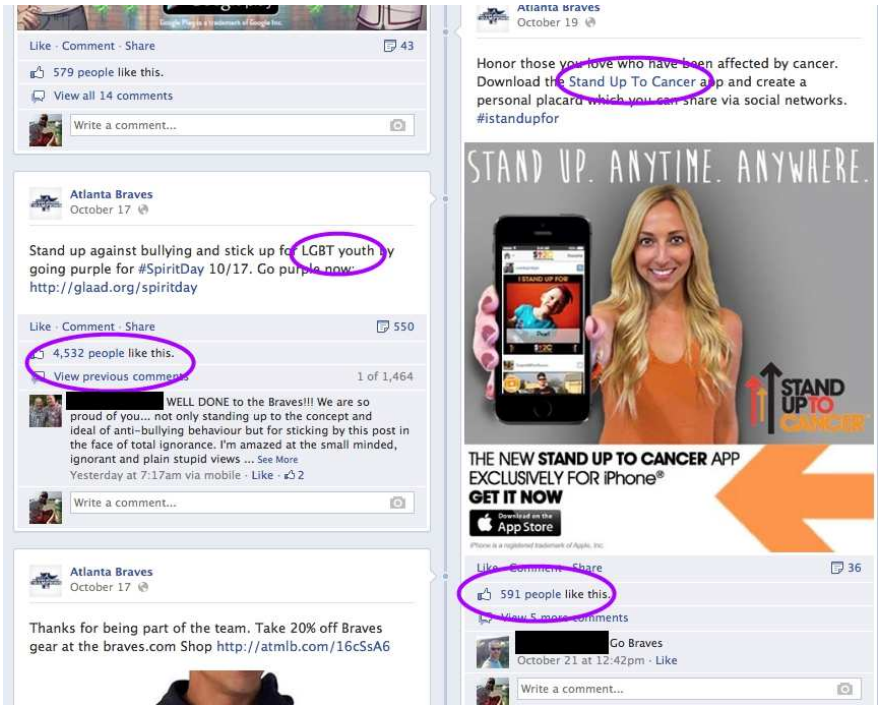


Figure 1. Atlanta Braves Facebook page, October 2013

This sparked ideas for how to create a social justice-based math course. We wanted students to look at stories like this, follow their digital trails, and use their critical literacy skills to determine for themselves what is really happening. Then, we wanted students to take their analysis a step further, by going back to the original SI article and making their own comments using the math problems they created. This would have allowed the middle school students to participate in the public world, develop their own social justice mindsets and activism, and gain valuable critical and digital literacy skills. The math skills used would depend on the issue and article at hand. For this hypothetical example, students might have completed basic calculations of percentages of differences in "likes" on similar posts, and also the percentages of negative vs. positive comments. For more sophisticated mathematical analyses, students could have

compared the Braves' equity statements with those of other sports teams, creating charts to compare them. They could have also calculated if these statements differed across regions or time periods. They could have shared their findings in text format, or if the online forum allowed it, they could have uploaded a picture showing charts they created.

I employed qualitative research methods throughout the course (including the course design process) to evaluate our curriculum method. Through this course and research study, we discovered this class affected not only students' commitment to social justice, but their beliefs about their own learning and school community.

Potential Limitations

It is often difficult to envision the ways that social justice might be enacted in the mathematics classroom. Teachers who promote practices that ask students to critique dominant authority or take stances counter to societal norms put themselves at significant risk by doing so (Gutstein, 2003). Likewise, teachers may find it difficult to implement social justice lessons in the context of a system that values high-stakes testing.

One danger of engaging in any social justice education work with students is assuming that they will react to new information the way you want them to (Kumashiro, 2009). Instead of seeing homophobic and racist comments as problematic, students may view them as supporting their own pre-existing views, and subsequently as justification for continued discrimination. Kumashiro (2009) suggested the "development of a shared lens" (p. 720) combined with the "acknowledgment that any lens is partial" (p. 720) to direct students to read information in multiple ways. This plurality is a way to foster the dialogic hermeneutic desired by queer theory and pedagogy (Britzman, 1995a). As Kumashiro (2009) stated, "a fundamental goal for teachers...should be neither to insist on learning the one 'best' lens, nor to value all lenses

equally. Rather, the goal should be to articulate a variety of lenses and examine what each one makes possible and impossible" (p. 720). This also helps prevent the moral conundrum discussed by Warnick and Stemhagan (2007) that can develop in students when they are taught there is only one way to find the right answer in mathematics, and adds an additional critical, evaluative method that incorporates student voice.

Furthermore, this project could be considered fraught because antidiscrimination laws are currently decided on a state and school district level, so not all LGBTQ students and teachers are protected. At times one group is protected or focused on more in the public sphere while the other is not (Blount & Anahita, 2004). One current example is North Carolina where students are protected under the School Violence Prevention Act (Dalton, Hackney, & Perdue, 2009) but teachers are not protected under employment laws. Fear of discrimination or violence can cripple a student's ability to succeed, and prevent a teacher from feeling safe in the workplace. In the contemporary volatile social and political climate where LGBTQ issues rest in the U.S., some teachers may not be able to safely address these issues in their classrooms without facing the risk of termination or harassment. One of the reasons Fede and I felt our study site was ideal is that the school values diversity, and includes sexual orientation in their diversity statement, so here staff are protected despite the state's lack of inclusive policies.

From a mathematical standpoint, there are a number of challenges as well. In the age of standards based instruction and accountability, teachers often feel the pressure to cover the material outlined in their curriculum leaving little time for the exploration of social phenomena, even when mathematics is a crucial element in the investigation (Gregson, 2013). This may be related to the amount of time it takes to thoroughly conduct such investigations. In order to thoroughly engage students in projects like the ones we engaged in, it was imperative that

students had the time to read and think about the issues involved, analyze the arguments being made, construct their own counter-arguments and synthesize a response. This always took more time than we anticipated; time that some teachers might not want to sacrifice in their classroom.

Additionally, this queer math pedagogical project could not happen on an island. A larger network of support and celebration for diverse students is necessary for its success in future work. Students need to know that the school as a whole protects them in order to feel safe (Kosciw, Greytak, Diaz, & Bartkiewicz, 2010). If a school environment is toxic to LGBTQ students, one class that offers a counter opinion will likely not be enough to make all students feel safe. A queer math pedagogy must be one part of a more inclusive, school-wide effort to combat heteronormativity. It will work best if there is an established norm of openness, where no identity words are permitted as insults, and where students feel that every teacher is an ally. As Payne and Smith (2010) stated, "as long as stopping LGBTQ harassment is one more item on the long teacher 'to-do' list, it will not be consistently enforced" (p. 32). A consistent message must come from administration and teachers to translate into students' feelings of safety, which will ultimately enable their success (Kosciw, Greytak, Diaz, & Bartkiewicz, 2010). Before the study began, I believed The Anchor School was an inclusive place due to conversations I had with parents and teachers, their diversity statement, and their active Gay-Straight Alliance (GSA).

Researcher Positionality

My positionalities have great effects on both my research interests and commitments[1]. As a lesbian working in a conservative high school in Eastern North Carolina, I became more committed to LGBTQ rights as a whole and the rights of LGBTQ students and teachers in

[1] I use positionality rather than subjectivity, as positionality includes "how our subjectivity *in relation to the Other* informs and is informed by our engagement and representation of the Other" (Madison, 2012, p. 9)

particular. This, in turn, informed my research interests as a grad student. Additionally, it led me to examine theoretical concepts and practices related to LGBTQ communities. The ones that resonate with these interests are social justice education, queer theory, and queer pedagogy. I prefer queer theory to gay and lesbian studies because the latter is limiting and focuses on identity categories, while the former is broader and has a focus on deconstructing and questioning categories, including sexuality and gender but not exclusive of other aspects of identity (Turner, 2000), bringing it closer to social justice education.

My masters training as a folklorist focused on qualitative methods, particularly ethnographic methods, and this continues to shape the way I think about research. I think it is important to become invested in a community, to work collaboratively and reflexively, and to (when possible) share your work with the community. Throughout the research process I engaged with the school community, especially my students and cooperating teachers, and was transparent about the research process. I have also worked on a positivist study, where I conducted phone questionnaires with Lickert scales, and this reinforced my preferences for qualitative work. In the positivist study, I found that I was most interested in the side stories participants shared with me that illuminated their answers, and so found the Lickert scale data unsatisfying. Furthermore, my investigation into queer methods (which come from queer theory), has also strengthened my commitment to qualitative methods, as they stress an inclusion of emotions and self-reflexivity (Browne & Nash, 2010). Lastly, I see my research as part of my social justice activism, and thus value Participatory Action Research (PAR) methods, which aim "to live out the slogan that the personal is political" (Kemmis & McTaggart, 2005, p. 568).

School Context and Quaker Values

While the context will be discussed in more detail in the beginning of the analysis section, here I will briefly outline the school's atmosphere and values. The school's mission and values statement includes a discussion of seeking the truth, which can be seen as counter to queer values that believe in openness more than truth, or even multiple truths. Heath (1996), a Quaker educator, wrote "the 'peculiar mission' of a Friends school is to empower its members- faculty, staff, and students- to live more fully in Truth. For Friends, to 'empower' is to enable a person to be his or her own minister in seeking that Truth. 'To live more fully' is to witness in all one's acts that measure of the Truth one has experienced" (p. 5). Again, this seeking of truth conflicts with queer sensibilities.

As The Anchor School is based on Quaker principles, there is an emphasis on peace and valuing individuals' unique qualities (The Anchor School mission statement, citation omitted for anonymity). Students do not have to be Quaker to attend, but they do all participate in a weekly Meeting where teachers propose a "query," or topic for discussion, and everyone is allowed to speak if they choose. There is room for queerness in these meetings, as "the motion to speak must come from a deep place, after sinking into the quiet centre where the boundaries of self begin to soften and the worshipper feels in communion with God and the worshipping community" (Birkel, 2004, p. 47). While queer theory talks about breaking and crossing boundaries, this "softening" may be a smaller, quieter transgression. In school Meetings the students are not necessarily feeling a communion with God, but perhaps they too feel their own boundaries begin to "soften."

Silence and reflection are also valued at The Anchor School, and students begin and end each day by "settling in" and "settling out," in which they sit in silence for about ten minutes. Having participated in this, I can attest that it is calming and helps you center yourself, making it

a nice transition for students and teachers. Though it can feel like a guided meditation to outsiders, Quaker scholars point out that this is not exactly the case: "The silence is used for mediation, in the sense of concentrated thinking, and Quakers will talk of 'centring down' when they are in Meeting for Worship, though they do not use any particular meditational technique" (Bradney & Cownie, 2000, p. 59). Further, silence does not imply passivity, but is "a creative, active experience…it involves concentration, commitment and self-discipline on the part not only of the individual, but the worshipping group as a whole" (Bradney & Cownie, 2000, p. 60).

Lastly, the school values service. Quakers have a long tradition of service and activism, which often draws outsiders to the religion (Baltimore Yearly Meeting, 2012). Many figures of the American feminist movement, such as Alice Paul and Jane Addams, were Quakers (Bacon, 1986). While initially Bryan and I thought this focus on service meant that the school valued social justice, we found that community service at The Anchor School was often far from social justice. Part of this divide between service and justice work may stem from Quakers' tendency to avoid conflict (Bradney & Cownie, 2000). In Quaker Meetings (religious observances are called meetings rather than sermons or services), decision making can take months as full agreement is required before making a decision. As Bradney and Cownie (2000) point out, "Quaker decision-making is also Quaker dispute avoidance since one cannot dispute a decision which one has freely and fully consented to or which one accepts was made according to the promptings of the spirit" (p. 152). Social justice is contentious and it is nearly impossible to get a large group to come to consensus on issues surrounding race, gender, class, etc., especially if those decisions have to be made before one can take action. As Bacon (1986) also pointed out in her discussion on feminism and Quaker beliefs, "The Quaker devotion to nonviolence has sometimes made it difficult for Quakers to know how to handle anger" (p. 225). Anger, and

working through it, is often a part of social justice work. If The Anchor School leaders, or at least those who planned community service activities, were uncomfortable with anger from a Quaker mindset, then it makes sense that service was relegated to community clean ups rather than participating in the more emotional work required by social action. This idea resonates with the school's community service activities, which will be discussed in later chapters.

Dissertation Organization

This dissertation is organized in three parts. Part 1 contains this introduction, the literature review, and methods chapters. Part 2 is the analysis section, and begins with an introduction to the analysis. It contains chapters on the enactment of learning in the course—*processing*— and chapters on three additional themes found in the data—*recognizing the puzzle, resisting the average,* and *abandoning closure.* It includes a summary of accomplishments and also a chapter detailing challenges. Part 3 contains a conclusion chapter, implications and future research ideas.

CHAPTER 2: LITERATURE REVIEW

This complex literature review illustrates that it is impossible to tackle social justice topics with a singular pedagogy. Social justice is a messy, continuous process and is well-served by looking at it from multiple perspectives. In the case of *Math for a Cause*, we examined social justice primarily through text and numeric inquiry. For the sake of clarity, this literature review is divided into five distinct sections: social justice pedagogy, queer pedagogy, critical literacy, critical math, and new literacies. They will be presented in the order listed, and followed by a synthesis illustrating how they are connected. Figure 2 below also illustrates this connection. Essentially, social justice pedagogy is the motivation and underlying structure for *Math for a Cause.* However, I viewed social justice pedagogy (and the other pedagogies used) through a lens of queer pedagogy. Queer pedagogy questions and abandons existing boundaries and structures, and so the structures of each will be examined in the literature reviews as well as considered throughout the methods and analysis. To enact this pedagogy, I created a curriculum that relied heavily on critical literacy and critical math, and new literacies to a lesser extent. As the curriculum was text-heavy and dealt with emotionally difficult topics (explained in more depth in the methods chapter), critical literacy was necessary. New literacies, as in untraditional texts such as internet sources, were not used as much as originally planned. However, concepts from New Literacies were incorporated, primarily the idea that texts are socially constructed. All of these pedagogies share a connection to critical pedagogy.

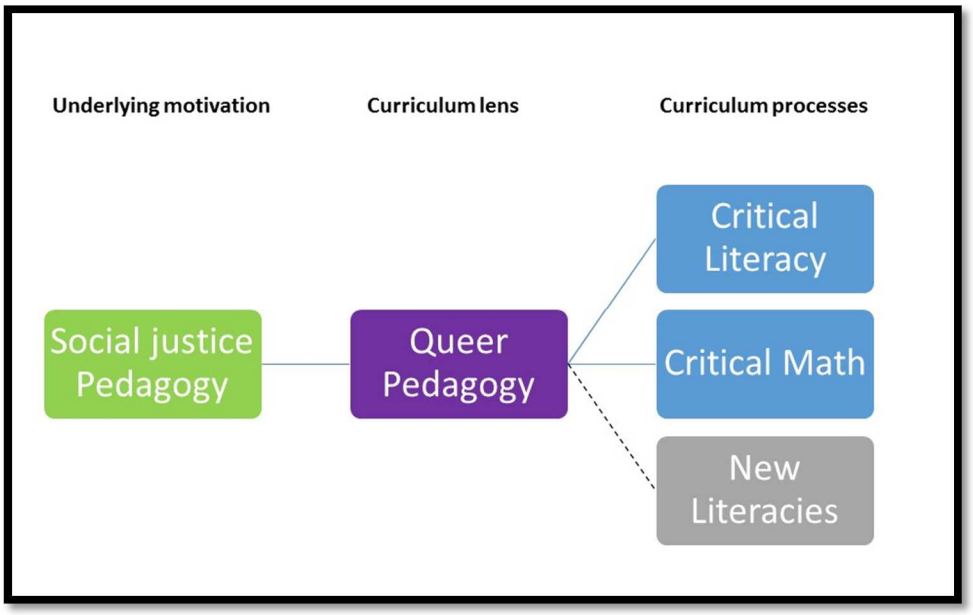


Figure 2. Literature review connections

2.1 SOCIAL JUSTICE PEDAGOGY

Social justice evokes images of activism, of protests and marches, of advocating for marginalized peoples. Social justice pedagogy and education also has a focus on action. Social justice pedagogy is, like all critical pedagogies, a way of thinking and framing pedagogy rather than a set of prescribed practices. This literature review will not contain a broad discussion of social justice pedagogy history and practices, as these are woven throughout the other literature reviews. Instead, I will focus the bulk of this review on literature from K-12 classrooms, whether taught by in-service or pre-service teachers during their student teaching placements. As such, I will not discuss the extensive literature on social justice pedagogy in teacher education programs or in higher education. I will discuss social justice pedagogical practices from all subject areas, emphasizing student outcomes. The social justice research that focuses on or even includes student voices is rare, so limiting it by subject would not be fruitful. Furthermore, since

my project is interdisciplinary, I wanted to investigate how social justice pedagogy was practiced in different subjects.

Definitions

Nearly all publications on social justice education include an explanation of the difficulty in coming up with a single definition, and that every scholar has a slightly different idea on the subject. Few definitions are focused on K-12 students, as the enactment of social justice depends on the local context. Social justice definitions and enactments also come from a variety of anti-oppressive movements and theories, such as "multicultural education, critical theory, anti-racist education, and critical race theory which were all direct responses to the dominant Anglo-American Protestant tradition" (Miller, 2010, p. 25). Given this, much of social justice education focuses on race, ethnicity, and socio-economic status. At times, gender is given consideration but other identity categories such as gender identity, sexual orientation, ability, religion, and nationality are not as frequently explored.

Despite the wide number of definitions, there are of course similarities between them. Social justice pedagogy stems from Freire's work, and so many scholars discuss his concepts of "reading the world and the word" and "conscientization." Researchers and practitioners want to instill in students a critical consciousness, to make them go beyond merely recognizing and caring about injustices to taking action against them. Many researchers and practitioners follow a distributive justice model, meaning the equal (or equitable) distribution of goods (for examples, see Boyles, Carusi, & Attick, 2009; Greene, 1998; Keddie, 2012). However, Boyles and colleagues (2009) pointed out that this sameness does not automatically lead to empowerment or liberation. Another common practice was the incorporation of culturally-relevant pedagogy (Ladson-Billings, 1995) and funds of knowledge (Moll, Amanti, Neff, & Gonzalez, 1992; seen in

North, 2009). Many educators also discussed a need for educating students to engage in a democratic citizenship (for example, McGee Banks & Banks, 1995; North, 2009). Social justice also involves reflexivity, both for the teacher and learner. There is also a heavy focus on the "social" in social justice, emphasizing the need to learn about and respectfully interact with different social groups, without judging them and placing them in a hierarchy. See Tables 1 and 2 for definitions of social justice from the perspective of teacher practices and student outcomes, respectively. Table 1 (at the end of this sub-chapter) shows how teachers think about and enact their practice (as described previously), and Table 2 shows what teachers want students to do as a result of their practice. In the latter, this includes helping students gain a critical consciousness and awareness (Cammarota & Romero, 2011; Greene, 1998; Hayden-Benn, 2011) teaching students to navigate obstacles, oppressions, and injustices (Ayers, 1998; Cammarota & Romero, 2011; Swalwell, 2013), giving students practical knowledge to accomplish these goals (North, 2009; Skerrett, 2010) as well as producing their own knowledge and texts (Cammarota & Romero, 2011, Yang, 2009).

After examining the different definitions, I chose Rendón's (2009) to use in formulating my research questions. She outlined a social justice education that entails: 1. "having a 'critical consciousness' (from Friere); 2. taking action to transform entrenched institutional structures to ensure that people from all social group memberships have equal access to resources and opportunities; 3. acting with love and compassion to work with people who have less privilege and resources; 4. working to heal and to provide hope for all people, especially those who are victims of social and economic inequities; and 5. a socially engaged spirituality (Carrette & King, 2005) where individuals seek to improve their being and that of the larger collective" (p. 10). Because I am working with students and want to examine how they enact social justice, this

definition works well as it lists both mindsets and specific forms of action. Though it is not natural for me to choose a definition that includes spirituality, this definition works best for the Quaker context of The Anchor School. Though not all students are Quaker, the school is founded on these values, as reflected in this portion of their mission statement:

> [The Anchor School] is a vibrant and inclusive learning community empowering students to think critically, creatively, and independently. We foster active exploration and quiet reflection, individual endeavor and collaborative engagement. Inspired by Quaker values -- pursuit of truth, respect for all, peaceful resolution of conflict, simplicity, the call to service -- we teach our children that it is possible to change the world. (source omitted for anonymity)

Social Justice Pedagogy in K-12 Practice

The literature on social justice education can be categorized broadly into two camps: 1) *teachers* who do social justice by working in high-needs schools with minoritized populations and who want to enable their students to succeed academically and (sometimes also) critique dominant society (Beliveau, Holzer, & Schmidt, 2008; Camangian, 2009; Johnson, 2012; Lee & Walsh, 2015; Keddie, 2012; some teachers in North, 2009) and 2) teachers who teach *students* to do social justice by enabling them to not only succeed in and critique dominant society, but to take social action (Bigelow, 1998; Hayden-Benn, 2011; some teachers in North, 2009; Pescatore, 2007; Swalwell, 2013; Westheimer & Kahne, 1998). While in the first category the teacher is doing the majority of the social action in the form of their approach to their teaching practice, in the second the students and teachers are doing the social action piece together. Sometimes these two categories intersect (Cammarota & Romero, 2011; Christiansen, 1998; Gutiérrez, 2014; Hines & Johnson, 2007; Hutchinson & Romano, 1998; Searle, 2009; Stern, 1998; Yang, 2009).

As *Math for a Cause* is focused on teaching students about social justice and getting the students to practice it (rather than the teachers being the only practitioners), the latter category holds the most relevance to this study. Sometimes the first category focuses a lot on functional

literacy (North, 2009) which can give students the navigational capital (Yosso, 2005) to successfully pass standardized tests and the like, but this does not necessarily mean that the students learned emancipatory strategies of social action. As Moje (2007) explained,

> from a social justice perspective, opportunities to learn must not only provide access to mainstream knowledge and practices but also provide opportunities to question, challenge, and reconstruct knowledge (Ladson-Billings & Tate, 1995). Social justice pedagogy should… offer possibilities for transformation, not only of the learner but also of the social and political contexts in which learning and other social action take place (Saunders, 2006). (p. 4)

Johnson, Oppenheim, and Suh (2009), in their study of student teachers, also found that distinguishing between social justice as working with a specific population and social justice as action are not necessarily distinct categories, and that teachers can have a difficult time discerning if their own practice aligns with social justice. In this respect social justice education shows its queer leanings, as it is not easily defined and is constantly crossing borders and blurring lines. As in the previous section, I want to distinguish between social justice practices of teachers and the outcomes for students, and so I will discuss these in different subsections below.

Teacher practices

Teacher mindset is often discussed in the literature. At a minimum, social justice educators must be able to recognize and name inequalities, and have the motivation to work to actively change these inequalities. Scholars and practitioners agree that "critical self-reflexivity is imperative to educating for diversity and social justice—it reflects the conscientization or critical consciousness that underpins an emancipatory vision of education" (Keddie, 2012, p. 162). Teachers must use and draw from a variety of critical theories, but also avoid treating their students as stereotypes and apply the theories to their students as individuals (McGee Banks & Banks, 1995). This also entails understanding students' discourse communities (Keddie, 2012).

For many educators, caring and developing relationships with students is a large part of their practice (Camangian, 2009; North, 2009; Reynolds, 2009). However, Johnson (2012) found that her teachers saw their practice as devoid of emotion, which she found problematic. North (2009) also cautions that care can be used to dominate, so teachers should continue to reflect on their practice and relationships. Lastly, Camangian (2009), Keddie (2012), North (2009) and others stressed that teachers must be willing to embrace uncertainty, and to allow their students to be uncomfortable.

One common thread in the literature on social justice teaching is using interdisciplinary units and co-teaching, which is particularly relevant to *Math for a Cause.* Given the intersectionality of social justice issues, it is logical that studying them in a single discipline is difficult. Christensen and Bigelow, high school English and social studies teachers, co-taught a class on Literature in American History and used the class as an opportunity to investigate the dark history of standardized testing in the U.S. (Christensen, 1998). Pescatore (2007), another high school English teacher, also felt it was natural to partner with a social studies teacher to help students identify writers' craft in historical and contemporary political documents. Westheimer and Kahne (1998) studied a middle school that was committed to social justice, in which students completed "transdisciplinary projects aimed at social needs, and to couple these with academic analyses of the social and institutional context" (p. 7). In Paul's private middle school, from North's (2009) study, students also completed interdisciplinary, thematic units and were only separated by grade level for math. In McGee and Hostetler's (2014) work reviewing and suggesting ideas for pairing math with social studies, they suggest that

> debates in social studies that are backed up with mathematical evidence improve their overall analysis and reflection of the issue. Mathematics is given both historical and

> contemporary contexts, and can assist in contemplating meaningful mathematical lessons. Both social studies and mathematics teachers perceive a value in including social justice issues in the classroom (Hostetler, 2012). (p. 223).

Though the lessons described were often interdisciplinary, there is a clear reliance on literacy methods (particularly critical literacy) and social studies: rarely do social justice lessons incorporate methods from mathematics, science, or the arts. As such, social studies and literacy are the most common pairings in co-teaching. However, in schools like Paul's and those studied by Westheimer and Kahne (1998), other subjects like science and art were also incorporated. For example, in Paul's middle school unit on genetic diversity, students learned about genetics in science and blended clay to match their skin tone (North, 2009). Hayden-Benn (2011) also described her use of diverse songs in her middle school music classes. Another notable exception is the use of the story line method, where elementary students participate in an imagined narrative by the teacher in which students create and embody characters that interact with one another as the story progresses. The teacher poses carefully-scaffolded questions to the class to move the narrative forward. A teacher studied by Hutchinson & Romano (1998) successfully used story line with third grade students to discuss homelessness, as the teacher noticed the students had deficit mindsets towards this population and would enter class joking about how they had teased homeless people they passed walking to school.

As social justice is based on classroom and community contexts, there are no correct units or lessons in social justice pedagogy. Each teacher must decide what will work best for their students. In many cases, this includes teaching them how to 'play the game' in the form of grades, standardized test scores, and extracurricular activities to give them a better chance at college admission (Bender-Slack, 2010; North, 2009). Many teachers asked students to critically

respond to texts, including topics such as standardized tests (Christensen; 1998; Pescatore, 2007), race in the U.S. (Camangian, 2009), Western expansion in the U.S. (Johnson et al., 2009), or global labor issues (Bigelow, 1998). As part of this critical reading practice, Pescatore (2007) taught her students to notice the subtlety of word choice, and how that could be altered to affect the tone of a text for different audiences. Another aspect of critical reading was to teach students that their problems are not individual but the result of systemic processes, such as when Walsh (Lee & Walsh, 2015) discussed economic systems with his students. To avoid students thinking that white people are all bad and/or to prevent white students from remaining mired in guilt, Camangian (2009) suggested showing examples of different models of whiteness throughout history, while Brion-Meisels (2009) suggested including lessons on white anti-racists. Along with critically reading texts, many teachers asked students to conduct their own research projects (Cammarota, & Romero, 2011; Hayden-Benn, 2011; Johnson et al., 2009).

Overall, practices in social justice education held the students at the center. Some took this further by implementing youth participatory action research (YPAR) (Akom, 2009; Cammarota & Ramero, 2011). In Stern's (1998) classroom, she had students co-plan the curriculum. Other schools, such as those in Keddie's (2012) study, practiced social justice not only in their approach to teaching but in their approach to caring for their students. In these Australian schools, resources were allocated equitably according to need, rather than dividing resources equally among students. Another way of keeping students at the center is linking lessons to contemporary events and their own lives (Bigelow, 1998; Christensen, 1998; Hayden-Benn, 2011; Lee & Walsh, 2015; Westheimer & Kahne, 1998). Hayden-Benn (2011), who engaged sixth grade students in a social justice club rather than relying solely on her music classroom, allowed students to create bulletin boards to educate their classmates about issues

such as AIDS and the rights of laborers. Hayden-Benn (2011) allowed the students to not only choose the topics but also make all the decisions for how the information was disseminated: she took the role of guide and facilitator rather than top-down leader. The emphasis on student-led classrooms is part of the definitions of social justice discussed previously, which include a heavy reliance on methods of discussion and reflection.

Student outcomes

As the majority of the social justice education literature focuses on teaching, there is less discussion of student outcomes. Some of this is gauged from researcher observations and teacher reporting, but less is reported from student voices. While it is likely easier to gain institutional approval to talk to teachers and observe classrooms than it is to interview students, the gap in the literature is considerable. In this section, I will first discuss the relatively concrete student outcomes and then discuss the more abstract student outcomes from social justice teaching.

From examining the existing scholarship, the main categories of concrete student outcomes are: (a) problem solving skills, (b) evaluating and analysis skills, (c) collaboration and community building, (d) knowledge production, (e) literacy skills, and (f) social action. These outcomes are not discrete: many times they intersect and intertwine with each other. I will discuss each of these in turn.

Problem solving is a necessary skill for students engaging in social justice. As Westheimer and Kahne (1998) asserted, "students must learn how to respond to social problems and also how certain problems come to the fore while others remain unnamed" (p. 18). Gutiérrez (2014) also stated that this problem discernment is part of students' "transformation of becoming" (p. 315) social actors. An example with high school students comes from Bigelow's

(1998) classroom, in which students examined corporate policy and marketing materials from Nike for 'loop holes' that allowed the company to exploit their workers and the environment. Problem solving also works for younger students, such as the teacher in Hutchinson and Romano's (1998) study who used story line with third graders. In this teaching method, conflict is part of the process and students are guided to working through their problems.

These examples also show that students developed analysis and evaluation skills while problem solving. Pescatore (2007) provided a good definition of these processes, by stating that "when students think critically, they interact with the text by skillfully analyzing the message, comparing that message with their previous knowledge, considering alternate positions, and synthesizing the information gained into a richer knowledge base" (p. 326). Swalwell (2013) asserted that analysis should also "emphasize the root causes of problems" (p. 3). Bigelow (1998) encouraged these skills by asking students to conduct a "global clothes hunt" where they researched not only where their clothes were made and what conditions the workers faced, but also found patterns such as that the countries where the cheapest consumer goods were made also had the lowest percentage of white people. Stern's (1998) students investigated similar themes, as "they learned to recognize and evaluate the barriers which separate all of us according to class and race, lifestyle and geography" (p. 283). By increasing skills in analysis and evaluation, students deepen their critical thinking skills, learn to dissect complex texts, consider differing points of view, and recognize hidden curriculums.

Evaluation and analysis can lead to collaborations, both in and outside of the classroom. As Akom (2009) stated, "enabling youth to deconstruct the material and ideological conditions that oppress them inspires a process of community building and knowledge production" (p. 512). Because many teachers engaged in this work use group discussions and reflections, students

bond as a class and create a collaborative community (Christensen, 1998; Hutchinson & Romano, 1998; Stern, 1998; Westheimer & Kahne, 1998). Johnson and colleagues (2009) noted that one teacher in their study facilitated this community building and collaboration through her "community circle" activity, which she used for group discussions where students were encouraged to "respect themselves and others, speak without fear, and take responsibility for their actions" (p. 305). Akom's (2009) students took their collaboration further by working with a national network of service providers and researchers to create a youth bill of rights for Berkeley, California.

Projects like Akom's (2009), where students are creating, lead us to the next outcome: knowledge production. These theme is summed up best by Yang (2009):

> Our goal was to train youth to become producers of strategic public texts, rather than consumers of political education. Youth were trained to: produce their own films; apply social theory to everyday media; debate through legal discourse; deconstruct and reconstruct academic texts; write research papers, literary analyses, and statistical reports; design websites; operate statistical software for the social sciences; and present to diverse audiences from academic researchers, to congressional policy-makers, to peers. (p. 458)

Other scholars, such as Moje (2007) and McGee Banks and Banks (1995) echo the need for students to create knowledge as well as understand knowledge produced by others. Hayden-Benn (2011) also suggested that students, because of their youth, may come up with simpler solutions that the "sometimes jaded, adult mind" (p. 57) has missed. This also ties to other student outcomes such as action and literacy, as most knowledge production examples detailed by educators involve an outward focus and require some form of literacy.

A wide range of literacy skills were gained by students in the social justice literature: writing a variety of texts, creating films (Akom, 2009; Stern, 1998), websites (Akom, 2009), conducting research (Akom, 2009; Bigelow, 1998; Johnson et al., 2009; Lee & Walsh, 2015; North, 2009), and critically reading texts (Bigelow, 1998; Johnson et al., 2009; Pescatore, 2007; Stern, 1998). All of these activities are connected to critical literacy, which Pescatore (2007) delineated from critical thinking by stating "critical thinking skills involve reflecting and research, but critical literacy goes one step further: the formation of citizens who are empowered and emboldened to act as a result of their conscious enlightenment" (p. 330). Bigelow's (1998) students wrote both research reports and poems as they learned about global labor issues. Many teachers included reflective writing in their curriculum, for example in Westheimer and Kahne's (1998) study of a middle school where "students were required to complete learning logs… and an evaluation of their group's cooperative work process" (p. 9). Students in other studies wrote poems, with the help of mentor texts, to reflect on their experiences (Bigelow, 1998; Cammarota & Romero, 2011). All of these forms of writing and reading include an engagement with the texts and each other, going beyond merely reading for comprehension. This engagement was illustrated by Christensen's (1998) students, who wrote "dialogic journals" where they responded directly to authors of the texts they were reading. Overall, the critical literacy practices in social justice classrooms gave students skills in critical reading and writing over a broad range of texts and media.

Action is the ultimate goal of social justice education. As Swalwell (2013) noted in her study of privileged students engaged in social justice, "rather than committing individual random acts of kindness or being involved in leadership roles divorced from root causes of social problems, privileged students educated in social justice pedagogy mobilize their privilege on

behalf of and act in alliance with marginalized people" (p. 3). Privileged status was not a requirement for social action, however, as seen by educators and researchers who worked with students from minoritized populations (Akom, 2009; Cammarota & Romero, 2011; Gutiérrez, 2014; Johnson et al., 2009; Yang, 2009). Social action by students occurred on a smaller, school-wide scale (such as Hayden-Benn, 2011) or a national scale (such as Akom, 2009). Action could be in the form of student presentations (Hayden-Benn, 2011; Stern, 1998; Westheimer & Kahne, 1998; Yang, 2009), dissemination of student-created materials (Akom, 2009; Hayden-Benn, 2011; Yang, 2009), or discussing unfair treatment with administrators to encourage policy changes (Cammarota & Romero, 2011).

On a broader scale, students wrote letters to newspapers and to legislators advocating for government changes and attention to social justice issues (Johnson et al., 2009; Pescatore, 2007), or presented their findings to policy makers (Akom, 2009; Yang, 2009). They tutored students in their community or worked with the elderly (North; 2009) and raised money for causes that were important to them (Hayden-Benn, 2011; Johnson et al., 2009; Pescatore, 2007). Students also participated in protests and larger activist movements, such as education for undocumented students in the U.S. (Gutiérrez, 2014). As with many of the literacy skills, action outcomes involved practice and expertise in public speaking for youth. This also included knowledge on how to engage different audiences, such as Yang's (2009) students who spoke to both their peers as well as researchers and policy makers. The wide variety of actions taken by students show that social action is not limited to participating in large protests: there are many things students can do to encourage social change from the classroom.

Other than these more measurable or visible skills, a more abstract outcome from the culmination of these skills is gaining a critical mindset. This can be traced directly from the

teaching practices enabling students to critically reflect on their own experiences as well as contemporary and historical events. Researchers point out that sometimes this may be emotionally painful for students (Bigelow, 1998; Hayden-Benn, 2011), but that this pain is necessary for growth (Leonardo, 2009). As Camangian (2009) wrote, sometimes pain "is essential to move students' analyses from the personal to the interpersonal, and to address cross-cultural and gendered differences" (p. 505), even though sometimes it can cause students to shut down (Brion-Meisels, 2009). Forging these interpersonal connections is crucial to a critical mindset and social justice. These connections also help move students from seeing inequality as an individual issue to beginning to see the systemic connections between issues.

Another skill needed for student's critical mindset is the recognition of social problems. While this may seem simple, this recognition must include knowledge of systemic oppression (Christensen, 1998). As Wilson-Segura wrote (Miller, Wilson-Segura, & Lorenzo, 2008) "my students cannot become social activists for positive change in their communities until they are able to identify the oppression that exists" (p. 105). Greene (1998) further stated that:

> The sense of injustice does not arise mainly because of some cognitive recognition. The reasons lie much deeper, below the threshold of feeling. Moreover, the experience of the sense of injustice is fundamentally social, involving a recognition that what may or may not affect the individual human being in her or his immediate situation will inevitably touch someone somewhere. (p. xlv)

Social justice education is an emotional process, and negative emotions can spur students to work for positive social change. By engaging students in questioning, reflection, and critical thinking, teachers and students can collaboratively create new knowledge from socially engaged emotional depths.

Limitations and Challenges

Social justice pedagogy, despite the advantages to student learning, has many limitations and challenges. First and foremost, school administrators and districts may be resistant to any

curriculum that is seen as promoting a progressive agenda (Westheimer & Kahne, 1998). Because of a real fear of losing jobs or facing student and parent resistance, many teachers avoid social justice in the classroom (Bender-Slack, 2011). This is likely why so many of the schools where teachers practiced social justice were private (North, 2009; Swalwell, 2013), schools with a social justice focus (North, 2009; Swalwell, 2013; Westheimer & Kahne, 1998; Yang, 2009), other alternative schools (Hines & Johnson, 2007; Keddie, 2012; Lee & Walsh, 2015; North, 2009; Stern, 1998), or alternative programs housed in traditional schools (Cammarota & Romero, 2011; North, 2009). Additionally, Beliveau, Holzer, and Schmidt (2008) fear that in some spaces social justice may be equated to political correctness and that students and teachers both will censor themselves for fear of offending. As Bender-Slack (2011) noted, safety—which political correctness purports to foster—and social justice are not an easy pairing.

Additionally, the teaching strategies of dialogue, reflection, and relationship building are not fool-proof. For example, North (2009) noted that one teacher, Joe, was very popular with some students but that his easy-going manner alienated others who wanted defined boundaries between themselves and their teachers. And even if these practices were miracle methods that worked perfectly every time, because social justice depends largely on context the findings can be difficult to transfer to other school contexts. Regarding the use of dialogue in the classroom, Jackson (2008) pointed out that

> we cannot substantially change perspectives and behaviors simply by exposing our students, against their wills at times, to one another as if they were all truly equal or differently positioned in our classes. Given the structural nature of injustice, strategies to replace silence with dialogue are hardly guaranteed to be successful for meeting the needs of those who can quite reasonably perceive their having little reason to collaborate. (p. 140)

Teachers' will to create a collaborative environment will not always be met with enthusiasm from students. Christensen (1998) and Bigelow (1998) noted that frequently as students engaged

in discussion and reflection they were left without hope, and noted that teachers should include examples of positive change throughout history to prevent students from being stuck in a negative mindset. Bigelow (1998) also feared that he had created a dichotomy of "good" and "bad" people and companies, and also that his students pitied those in impoverished countries rather than seeing them as social actors who were working for change. He was not alone in worrying that in teaching for social justice, he had inadvertently perpetuated a deficit model of non-Western or non-white American peoples (see also North, 2009). In Stern's (1998) class, students created presentations to educate their peers on the dangers of sexually-transmitted diseases and included some problematic stereotypes (though Stern did not identify them as such) of girls who dress provocatively being more likely to engage in risky behavior than their modestly-dressed peers. Additionally, North (2009) noticed that in some schools students and teachers discussed race and socio-economic class easily, but did not give the same attention to gender or sexuality. Some oppressed identities are given more attention because of the student population, but this attention can at times create a hierarchy of identities.

Another problem was noted by both North (2009) and Swalwell (2013), who worried that privileged students were using social justice to increase their own cultural capital, rather than to enact social change. As North (2009) noted in one classroom she observed, "the students seemed to be learning the language of social justice but not necessarily understanding the suffering that accompanies economic and cultural injustices or the relinquishing of privileges that accompanies the redistribution of power and wealth" (p. 126). Though the teachers at this private middle school made every effort to get students to examine their privilege, students' feelings of entitlement remained (North, 2009). Similarly, in Swalwell's (2013) study of a private high school, she found that some students believed "that progressive social change at a

fundamental level is unrealistic,...[and so believed that] it is better to direct energy toward living as consciously as possible by attending to one's own consumer purchases, hobbies, and personal interactions" (p. 5). Other students in her study felt that "any wrongdoing in the world … can be explained primarily as bad, powerful people acting unethically or as oppressed people making poor decisions" (p. 5). This lead to Swalwell's (2013) fear that students were using their social justice knowledge only "to write a much stronger college essay or leverage required community service hours with those deemed less fortunate in order to pad a résumé" (p. 3) These students had an individualistic view of social justice, and thought that individual merit and action were more important than engaging in systemic challenges to the status quo. The students North (2009) and Swalwell (2013) observed thought it better to give to charity than to think about how charities function to perpetuate a system of inequality.

Lastly, teachers and students struggled in conceptualizing the form their social action might take. Teachers can struggle between teaching their students how to function within the system compared to teaching them how to transform it (North, 2009). Students may have a difficult time seeing how they can act on social issues, especially if they equate action only with "the spectacle of the protest" (Yang, 2009, p. 458). Without other models, such as letter writing or research dissemination, students may feel that their actions are not important or may not even recognize their work as a form of social action. These models must also go further than Band-Aid solutions such as fundraising without investigation. As Hayden-Benn (2011) wrote,

> while such activities promote compassion and generosity, the root of the problem is unaddressed. Students are seldom led to question why such extreme poverty exists. If they cannot identity the structural roots of such poverty, how can they be expected to create solutions beyond fundraising? (p. 54)

Another aspect of engaging in social action is examining a school's mission. As Joe, a participant in North's (2009) study proclaimed, his school had an anti-racist mission but this was not evident in their curriculum and disciplinary practices.

Summary

Despite the tensions and challenges in teaching for social justice, many educators remained committed to the cause. By using classroom techniques such as reflection, questioning, dialogue, collaboration, and critical literacy, teachers instill in their students a critical mindset committed to social change and action. Students gain valuable literacy skills as well as learning how to problem solve, evaluate and analyze complex information, and build community while producing knowledge. There are many definitions for social justice pedagogy, but this is not a weakness, as the practice is flexible and can adapt to a variety of classroom and community contexts. The challenges to social justice are primarily resistance from students, colleagues, and administration who may find social justice a threat as it causes students to consider difficult topics. The flexibility—and perhaps even the difficulty—of social justice pedagogy, as well as common techniques, make it a good match for queer pedagogy. As will be seen in the next section, queer pedagogy holds a disdain for rigid boundaries and relies heavily on dialogue and reflection.

Table 1

Definitions of social justice in education: Teacher practices and mindsets

Author(s)	Definition
Ayers (1998)	1. "Teaching that arouses students, engages them in a quest to identify obstacles to their full humanity, to their freedom, and then to drive, to move against those obstacles….the fundamental message of the teacher for social justice is: You can change the world" (p. xvii)
Boyles, Carusi, & Attick (2009)	1. Distributive paradigm: "a person operating from this …paradigm argues for equality of distribution, and when this equality is met, their claims for social justice are satisfied" (p. 37) 2. Critical paradigm: Have a "specific goal of exposing and eradicating the same power structures [those in the distributive paradigm] wish to preserve" (p. 37) 3. **Note**: these were defined broadly and applied *to* teachers, not for teachers to use
Grant & Agosto, (2008)	1. Values and ideals essential to a social justice framework: community and collaboration; reflection; social and critical consciousness; social change and change agents; culture and identity; effects of power
Greene (1998)	1. "Teaching what we believe ought to be…for the sake of arousing the kinds of vivid, reflective, experiential responses that might move students to come together in serious efforts to understand what social justice actually means and what it might demand…arousing a consciousness of membership active and participant membership in a society of unfulfilled promises… 'conscientization'" (pp. xxix- xxx)
Hines & Johnson (2007), as cited in Johnson (2012)	1. "Educators committed to social justice exhibited specific kinds of critical literacy practices… systems literacies (articulated as knowledge) and strategic literacies (articulated as action). Individuals with systems literacies understand the difference between oppressive systems of power and individual behaviors Strategic literacies are … based on knowledge of particular people and specific situations and contexts, that is, to work both within and against the system (p. 150-151)

Table 1 *continued*

Author(s)	Definition
Hutchinson & Romano (1998)	"The commitment to teach for social justice is not a commitment to a particular ideology, but a commitment to assist students as they grapple with the demands of daily moral living" (p. 254)
Johnson, Oppenheim, & Suh (2009)	1. A "broad and contextually contingent definition of social justice curriculum is one that will best support and encourage burgeoning social justice educators" (p. 294) 2. Definitions of social justice will depend on individual teachers and their classroom contexts, and must be flexible, as they will change through practice.
Keddie (2012)	1. Ms. H, principal in a HS, says equity means "to remove the barriers in students' lives that prevent them being all they can be" (p. 13) 2. Framework from Nancy Fraser (2007) "justice requires social arrangements that permit all to participate as peers in social life. On the view of justice as participatory parity, overcoming injustice means dismantling institutionalized obstacles that prevent some people from participating on par with others, as full partners in social interaction" (p. 13) 3. Teaching practice: challenging deficit constructions, valuing student culture, creating a welcoming environment
McDonald (2005)	1. "Social-justice teacher education provide prospective teachers with opportunities to develop respect for individuals' differences and recognize how those differences might be informed by individuals' affiliations with particular social groups, such as those based on race, ethnicity, or class … social groups' differences are acknowledged rather than denied" (p. 419)
McGee Banks & Banks (1995)	"We define equity pedagogy as teaching strategies and classroom environments that help students from diverse racial, ethnic, and cultural groups attain the knowledge, skills, and attitudes needed to function effectively within, and help create and perpetuate, a just, humane, and democratic society… it is not sufficient to help students learn to read, write, and compute within the dominant canon without learning also to question its assumptions, paradigms, and hegemonic characteristics. Helping students become reflective and active citizens of a democratic society is at the essence of our conception of equity pedagogy" (p. 152)

Table 1 *continued*

Author(s)	Definition
Miller (2008)	Five "Re-s" 1. Reflect (thoughts and feelings on a situation) 2. Reconsider (think about what they could do differently) 3. Reconceptualize "students develop a sense that there is more than one way to handle an issue around social justice when it emerges" (p. 13) 4. Rejuvenate (create ally groups, take time out to avoid burn out) 5. Reengage (support teacher development, help them navigate the teaching profession or imagine other ways can stay in the profession if leave the classroom) "
Moje (2007)	1. "Recognition that learners need access to the knowledge deemed valuable by the content domains, even as the knowledge they bring to their learning must not only be recognized but valued" (p. 1) 2. It is "more than providing equitable learning opportunities …[it] should…offer possibilities for transformation… for all youth, even those who are privileged … social justice pedagogy is not restricted to schools populated by youth of color or youth from low-income communities" (pp. 3-4) 3. From her review of the literature, social justice is seen as: access to expert subject-matter knowledge; the foregrounding of everyday knowledge; access to useable disciplinary knowledge and ways of knowing; knowledge via access to ways of producing knowledge
North (2009)	1. Teaching students to have functional, critical, relational, democratic, and visionary; letting students have experiences and develop relationships that encourage them to value social justice; teachers developing emotional connections with students
Oakes & Lipton (2003)	1. To uncover, examine, and critique the values and politics that undergird educational decisions and practices as teachers 2. Challenge educational common sense and ask important questions about why we do the things we do in schools and who benefits from them 3. Attend to the ways in which the school experience may be one of oppression and/or liberation

Table 1 *continued*

Author(s)	Definition
Rendón (2009)	1. "Having a 'critical consciousness' (from Friere) 2. Taking action to transform entrenched institutional structures to ensure that people from all social group memberships have equal access to resources and opportunities 3. Acting with love and compassion to work with people who have less privilege and resources 4. Working to heal and to provide hope for all people, especially those who are victims of social and economic inequities 5. A socially engaged spirituality (Carrette & King, 2005) where individuals seek to improve their being and that of the larger collective" (p. 10)
Swalwell (2013)	1. Teachers for SJE "work to disrupt rather than reproduce inequalities. They call for content that includes counterhegemonic resources with a focus on understanding forms of oppression, student-centered democratic classrooms with opportunities to connect curriculum to students' lives, and opportunities for collective action around social issues that work toward building a more just society (p. 2)
Tan (2009)	1. 5 E's: engage: building trust, respect, and buy-in; educate: developing academic and critical competencies; experience: from exposure to lived experience; empowerment of self: knowing that there is hope; enact: what are you doing to do about it?
Yang (2009)	1. "An effective social justice agenda must begin to consider a strategic radicalism. As social justice literature advances, we should think beyond political education, and towards a strategic education" (p. 462)
Zeichner (2009)	1. Social justice "seeks to address both recognition (caring and respectful social relations where all individuals and groups are treated with dignity) and redistribution (where there is a fairer distribution of material resources)" (p. xvi) 2. Social justice in teacher education includes preparing teachers to: be culturally responsive; explicitly address oppression and injustice, be activists; possess the content knowledge needed to prepare students for success

Table 2

Definitions of social justice in education: Student learning

Author(s)	Definition
Ayers (1998)	"Engages [students] in a quest to identify obstacles to their full humanity, to their freedom, and then to drive, to move against those obstacles" (p. xvii)
Cammarota & Romero (2011)	1. "Building knowledge not only for survival purposes but also for personal, institutional, and social transformation" (p. 494) 2. "Provides young people with a sense of hope and the drive to challenge inequities limiting their potential to help themselves as well as others to experience a full, unmitigated humanity" (p. 494) 3. "Promote transformational resistance" (p. 496) 4. "Students study and gain insights that lead to both personal and social transformation… [and] foster an awareness of how to redefine one's self, community, and world in more positive, just terms. These redefinitions are necessary for young people to feel capable and competent as agents of change, whether the change is initiated at individual, institutional, or societal levels (p. 503)
Greene (1998)	"Arousing the kinds of vivid, reflective, experiential responses that might move students to come together in serious efforts to understand what social justice actually means and what it might demand…arousing a consciousness of membership active and participant membership in a society of unfulfilled promises… 'conscientization'" (pp. xxix- xxx)
Hayden-Benn (2011)	"I want my students to understand the complex structures and inner workings of our society which maintain the status quo of the privileged and the oppressed" (p. 51)
North (2009)	Teaching students to have functional, critical, relational, democratic, and visionary; letting students have experiences and develop relationships that encourage them to value social justice
Skerrett (2010)	K-12 students who engage in social justice inquiries develop vital academic knowledge and skills, critical understandings about oppression in the world, and strong dispositions to continue working toward social justice beyond the initial inquiries they conduct (p. 54)
Swalwell (2013)	Outcomes: "students will be aware of injustices, feel a sense of agency to address those injustices and, ultimately, choose to act by participating in social movements and organizing around these issues" (p. 2)
Yang (2009)	"Our goal was to train youth to become producers of strategic public texts, rather than consumers of political education" (p. 458)

2.2 QUEER PEDAGOGY

While social justice is the underlying motivation for this dissertation study, it and the other theoretical frameworks are viewed through a lens of queer pedagogy. This section will start not with the pedagogy itself, but with a brief explanation of queer theory, from which it stems. I will then discuss definitions and tensions between queer pedagogy as a theoretical approach to education compared to its practical applications in classrooms.

The majority of my examples draw from English education because of the text-heavy focus of the course, and because there has been little queer work in mathematics education. Mendick's (2006) book, though she includes a chapter claiming the use of queer theory, instead uses Butler's concepts of gender as a way to talk about the differences between boys and girls. This is indicative of a focus on math education research on gender binaries, such as Esmonde's (2009) work on questioning gender binaries in math. While Esmonde (2009) and Mendick (2006) want educators to stop essentializing gender on a binary, they are not necessarily advocating for disrupting the concept of gender itself or broader implications of heteronormativity. Queer work has to go beyond this multiplicity to questioning structures. Rands (2009) work stands out in this regard as an investigation into queering mathematics, and in hir introduction ze lamented the absence of mathematics from queer conversations. Perhaps it is a queer move in itself to focus a literature review for a study in a math class on literacy rather than numeracy.

Queer Theory

Queer theory is to academia what surrealism was to the art world: a playful break from realism and a purposeful disruption of reality. And yet, queer theory cannot be easily categorized. A strict categorization would mean being static instead of fluid, giving into the

status quo instead of turning it on its head, and that is not the goal of queer theorists. As explained by queer theorist David Halperin, as quoted in Turner (2000), "queer is by definition *whatever* is at odds with the normal, the legitimate, the dominant. *There is nothing in particular to which it necessarily refers*" (p. 134).

This non-definition of queer extends to queer theory. Queer theorists do not like to use a restrictive definition, but do think of themselves as firmly outside of normativity, particularly heteronormativity (Halberstam, 2011). While queer theorists love to debate, they generally agree that queer theory should be disruptive, subversive, shift paradigms, and should be pluralistic and inclusive in definition- that is, if it is defined at all (Turner, 2000). Queer theory also involves the study of limits (of texts, institutions, and knowledge), ignorance (as resistance to, and constituted by, knowledge), and reading practices (one can question a text and read it in dialogue with others) (Britzman, 1995a). Queer theory also brings a "theoretical shift from *identities* to *identifications*," meaning from identity politics that rely on strict categories to a more fluid idea of the self, that "highlights the negotiations of differences vis-à-vis identificatory practices embedded in unstable and unfixed realms of *queer*—a radical positioning that is committed to disturbing, disrupting, and decentering normative discourse that excludes in its attempts to include" (Ruffolo, 2007, p. 255). The desire to disrupt norms can bring queer theory into social justice practices in education, as queer theorists love to argue against oppressive structures that are seen as normal in society, including schooling.

Queer pedagogy

Pedagogies of LGBTQ Inclusion

Though writers who discuss queer pedagogy use different definitions, they do agree that a queer pedagogy is fundamentally different from lesbian, gay, bisexual, transgender and queer

(LGBTQ) inclusion, anti-homophobia, or as Britzman and Gilbert (2004) call it, consciousness-raising pedagogies. The idea behind these techniques is that by including stories of gay and lesbian people in the curriculum, this will (a) teach heterosexuals that gays are just like them, and (b) give LGBTQ youth positive role models (Britzman, 1995a; Britzman & Gilbert, 2004; DePalma, 2010; Goldstein, Russell, & Daley, 2007). Though these goals are not damaging on their own, the unintended results may be. Focusing on tolerance of LGBTQ people does not illuminate the broader societal causes of homophobia, nor does it require much reflexivity from the learner or teacher, which is necessary for a queer pedagogy. Furthermore, these pedagogies focus on queer as a noun (meaning non-heterosexual people), not queer the verb (meaning the disruption of norms). For example, Sadowski (2010) worked with preservice teachers on LGBTQ issues in relation to their core values about teaching, and introduced LGBTQ issues with data on bullying and suicide, which posits LGBTQ individuals in a deficit model. While the preservice teachers did come up with lessons incorporating queer historical figures, this framework is still limited to individuals, and could perhaps have been taken further if queer pedagogy was incorporated for a more critical lens. As Rands (2009) noted in hir speculation of "Mathematical Inque[ee]ry", queer pedagogy as a construct against normalcy "goes beyond mere inclusion of queer students, families, and issues into extant frameworks and allows elementary teachers and students to deconstruct and disrupt educational norms as well as imagine new possibilities in mathematics and in the world" (p. 183).

Because these models of inclusion put the emphasis on the individual, they do not require teachers or students to examine the school's role in heteronormativity and uneven power relations (Ferfolja & Robinson, 2004). Additionally, these pedagogies often focus only on people who fit into the neat categories of gay or lesbian, and occasionally gender-variant people,

though usually these groups are essentialized (DePalma, 2010) and left out are those on the "margins of the margins" (Kumashiro, 2001), the queerest of the queer. The largest critique of an LGBTQ inclusion or consciousness-raising model is that instead of celebrating differences it merely recasts them as sameness (Britzman & Gilbert, 2004; Goldstein, Russell, & Daley, 2007; Krywanczyk, 2007; Loutzenheiser, 1998; Loutzenheiser & MacIntosh, 2004; Luhmann, 1998; MacIntosh, 2007; Mayo, 2007; Quinlivan & Town, 1999). Meaning, using arguments such as 'we're all the same under our skin' merely serves to "constitute a re-assertion of traditional rules and roles … [while the] dominant group must sanction the voice of Others" (Bryson & de Castell, 1997, as cited in Goldstein, Russell, & Daley; 2007). Or, as Loutzenheiser and MacIntosh (2004) wrote, "moments of inclusion often encourage a separating out of those in the added group but do not complicate and/or merely reify difference" (p. 155). So while an LGBTQ inclusion model stems from good intentions, it falls short in that it essentializes queer experiences and people, does not require questioning of institutional implications to homophobia, and flattens differences to sameness under a goal of tolerance.

Definitions

In contrast to the inclusion pedagogies described above, queer pedagogies aim for greater complexity. Furthermore, given the refusal of one definition for queer theory by queer theorists, it should be no surprise that educational theorists have played with many definitions of queer pedagogy. Some of these definitions are shown in Table 3; though displaying them in such a static form is an un-queer move. Additionally, since queer as a theory has refused to be pegged and formed into an easily-recognizable object, so too does queer pedagogy refuse to be contained in a toolkit of easily-applicable techniques or classroom practices (see Table 4 for examples). As Luhmann (1998) stated, it should be thought of instead as a question.

Yet despite the desire for difference and nonconformity, there are some fundamental similarities in the way education scholars define queer pedagogy. Most agree it includes questioning normalcy, heteronormativity, reading and teaching practices, and boundaries and limits (Bryson & de Castell, 1993; Britzman, 1995a; DePalma, 2010; Ferfolja & Robinson, 2004; Goldstein, Russell, & Daley, 2007; Krywanczyk, 2007; Kumashiro, 2001; Luhmann, 1998; Meyer, 2007; Quinlivan & Town, 1999; Weems, 2007; Winans, 2006). Kumashiro (2001) called for a practice of education for and about the Other, as well as being critical of privileging and Othering while working to change students and society. While these ideas are more method than definition, they are cited by other scholars who do work in queer education issues, such as Meyer (2007), as definitions. Because Kumashiro calls these practices, they are more specific than other definitions, and importantly while he uses the phrase "critical of" he does not mention "questioning," or "norms," both key words in queer theory and in other queer pedagogy definitions, making his ideas the least queer of the group.

Queer pedagogy has a lot in common with the ideas of social justice educators. Both camps value dialogue (both student-student and student- teacher), questioning structures of oppression, encouraging social action (though not all queer pedagogy includes this as a goal), and including voices that are typically excluded (Kumashiro, 2001, 2009). Queer pedagogy also has many commonalities with critical literacy. The focus on print and other media in critical literacy is one major distinction between the two, as queer pedagogy is broader, and might examine rule systems as evidenced by behaviors, not only texts. Additionally, queer pedagogy fundamentally seeks to disrupt norms, binaries and hierarchies, particularly those that create and reify heteronormativity. Heteronormativity can definitely be considered under a critical literacy framework (Jacobi & Becker, 2013), but it is not a primary consideration.

While there are many similarities between different scholars' definitions, the differences seem to depend on whether the author is writing in a primarily theoretical realm (Britzman, 1995a, 2012; Britzman & Gilbert, 2004; Luhmann, 1998; Macintosh, 2007; Meyer, 2007; Miller, 1998; Weems, 2007) or one grounded in their[2] practice (Bryson & de Castell, 1993; DePalma, 2010; Ferfolja & Robinson, 2004; Goldstein, Russell, & Daley, 2007; Jacobi & Becker, 2013; Krywanczyk, 2007; Kumashiro, 2001, 2009; Lewis, 2012; Schippert, 2006; Sumara & Davis, 1999; Winans, 2006; Whitlock, 2010). These differences will be explored later in the "tensions in practice" and "methods and modes of practice" sections. Since this paper seeks to ground queer pedagogy in the practice of the English methods classroom, my own definition will follow a practitioner model. I am defining queer pedagogy as a method that holds questioning at the center (DePalma, 2010), particularly questions of norms (including limits, binaries, and boundaries), and especially the norms of knowledge and our reading practices. Queer pedagogy has a particular focus on heteronormativity, though it is intersectional (Crenshaw, 1991) in that it includes questioning of not just sexuality and gender but other social categories such as race, class, nationality, and ability. (Some may prefer the term assemblage (Puar, 2007) to intersectionality, but I use the latter because it is rooted in practice and lived experience). Queer pedagogy requires self-reflexivity from the teacher and student, as both must constantly question their techniques, assumptions, and prior knowledge. And lastly, like Winans (2006) and DePalma (2010), I see queer pedagogy as tied to the small, quotidian moments in classrooms that allow for questioning and mental stretching of norms and boundaries.

[2] As part of a queer practice, I choose to use a singular they or their rather than s/he or his/her

Tensions in practice

While queer education theorists and practitioners agree that questioning normalcy is a large part of queer pedagogy, there are underlying tensions evident between queer pedagogy as a theoretical ideal and queer pedagogy in practice. This has led many teachers to feel frustrated (DePalma, 2010) or to question queer pedagogy's very existence in real classrooms (Bryson & de Castell, 1993). These tensions are justified, for how can all practice be questioned and non-normalized when teachers and teacher educators are working in a normalized institutional system? Practitioners must walk a fine line between radical expressions of queer pedagogy and 'playing the game.' Queer education theorist Talburt (2009) also pointed out that there are differences in a queer theory which is about uncertainty and a queer pedagogy that "implies a future good" (as summarized by DePalma, 2010). But as Talbert asked, "might it be enough for 'queer' to function as a tool for thinking, and might that be enough to transform practice?" (Talburt 2009, as cited in DePalma, 2010, p. 55). As Urrieta (2009) stated in his work with Chicana/o activist educators, selling out and activism do not have to be an exclusive binary. Since queer theory (and pedagogy by extension) is against binaries, there should be more room for compromise, and an acknowledgement of the embodied, lived experience of educators using queer pedagogies.

From examining texts on the subject, and listening to presentations at education conferences, I have noticed "the danger of organizing our work along a queer spectrum, where the 'more queer' is privileged…over the 'less queer'…visible work in classrooms" (DePalma, 2010, p. 55). In other words, a pedagogy built on a theory that is anti-normalcy cannot avoid creating its own norms and expectations. In order for a theory to be utilized it has to have some basic principles, but when that theory is as fiercely anti-establishment as queer theory is, this will

always cause a level of tension. This tension is felt most strongly by K-12 teachers outside of the academy, who have stricter curriculum guidelines than college educators and thus do not have the luxury of subverting all instructional norms. Because of these tensions, the next section will discuss both an overview of methodological ideas posed by queer education theorists, and also modes of practice discussed by practicing teachers and teacher educators.

Methods and Modes of Practice

Given that queer pedagogy is highly conceptual and values the disruption of norms, there are no standard techniques. There are, however, ways of conceptualizing queer pedagogical methods, and examples of modes of practice. While some teachers may be frustrated by the lack of specific techniques, if teacher educators frame queer pedagogy as a way of thinking about teaching practices, then teachers can come up with unique methods suitable to their personal classroom needs. For a summary of how different teachers, teacher educators, and scholars have practiced (or conceptualized practicing) queer pedagogies, see Table 4. The next two sections will discuss the suggestions offered by scholars working primarily in a theoretical realm (Britzman, 1995a, 2012; Britzman & Gilbert, 2004; Luhmann, 1998; Macintosh, 2007; Meyer, 2007; Miller, 1998) and those working in a more practical realm (DePalma, 2010; Ferfolja & Robinson, 2004; Goldstein, Russell, & Daley, 2007; Jacobi & Becker, 2013; Krywanczyk, 2007; Kumashiro, 2001, 2009; Lewis, 2001; Schippert, 2006; Sumara & Davis, 1999; Winans, 2006; Whitlock, 2010). Scholars were placed in the two groups based on whether their article(s) discussed their own practice or the observed practices of others (practical realm) or if they were writing more broadly about the possibilities of queer pedagogy and distinguishing it from other pedagogies (theoretical realm). However, these groups are only loosely held together; there is much overlap between the two. Kumashiro (2001, 2009), for example, is often cited for both his

theoretical ideas and practical applications of queer pedagogy. Comparing them in this way—while it risks drawing a dichotomy, which queer theory is against—allows one to note the tensions between theory and practice discussed in the previous section.

Theoretical methods. The three broad methodological categories discussed in the theoretical queer pedagogy literature are: (a) questioning and deconstructing norms, (b) examining and questioning reading practices, and (c) examining existing teaching narratives (Britzman, 1995a, 2012; Britzman & Gilbert, 2004; Luhmann, 1998; Macintosh, 2007; Meyer, 2007; Miller, 1998; Weems, 2007). These categories are not distinct; they are tied up in, and implicate, each other. The first category comes from the heart of queer theory, which seeks to ask questions more than find static answers. This questioning should extend to the school itself as an institution (Meyer, 2007), and to the role of the teacher as implicated in upholding institutional and societal norms (Britzman, 2012). This dismantling of norms includes the questioning of heteronormativity, of heterosexuality as a discrete category (Quinlivan & Town, 1999), and comes from the queer theory method of focusing on identifications (as fluid ways of naming oneself) rather than identities (static categories of naming oneself and others) (Ruffolo, 2007).

An examination of reading practices allows teachers and students to reflect on how their own knowledge is formed, how the knowledge in the text is formed, and what representations these knowledges draw from (Britzman, 1995a). This allows readers to "explore what one cannot bear to know" (Britzman, 1995a, p. 165) and helps prevent them from remaining ignorant as a way of resisting this unbearable knowledge of differences. Looking at individual reading practices can also cause people to explore why they may be stuck in a "performative ignorance" (Luhmann, 1998). Luhmann (1998) suggested asking not only what is the text saying, but also "What does

this information do to one's sense of self? What does the knowledge ask me to reconsider about myself and the subject studied?" (p. 150).

Related to examining reading practices is examining texts, in particular teaching narratives. Britzman and Gilbert (2004) suggested that such narratives are "stories full of gaps" (p. 83) in that they follow standard tropes and do not allow for marginalized voices to be heard. For example, stories involving LGBTQ people are often portrayed as "times of difficulty" which "equate gayness with aggression," (p. 84) while leaving out how the educator is implicated in these narratives. Miller (1998), in discussing teacher autobiographies, expressed a similar frustration, in that the typical story arc is: 1) a teacher experiences an existential crisis, 2) teaches in a place that throws them out of their comfort zone, and 3) reaches enlightenment from this experience. Miller (1998) suggested instead that queered autobiographies as a curriculum practice would break free of this normalized structure and embrace the messiness of a range of plural identities, rather than coming to a neat conclusion. It is the hope of these theorists that queer methods can allow questions to dominate discussions, to expose hidden curriculums of both heterosexuality (Kumashiro, 2009) and of "consciousness-raising" pedagogies" (Britzman & Gilbert, 2004) and to "invite students [and educators] into crisis, and then help them work through it" (Kumashiro, 2001, p. 20).

Practices from the classroom. As mentioned previously, there is some dissonance between queer theory and pedagogy and how it is enacted in the classroom[3]. A participant in DePalma's (2010) No Outsider's project stated that although she values and uses queer pedagogy:

> The parameters in which I can act are really very narrow and being a best practice teacher seems to line up with being a heteronormative teacher…my actions in the classroom will rarely, willingly, be in opposition to good practice (because that is what pays me)—which really isn't very queer. (p. 54)

[3] This section will not include texts on LGBTQ inclusive practices, such as Sears (2003)

Whitlock (2010) also pointed out that there is still a need to create safe spaces to deal with LGBTQ issues—or queer as an noun, rather than a verb—that cannot be ignored in a search for a queer(ed) pedagogy. She gave the example of one of her gay male student teachers who was having a difficult time with homophobia in his classrooms, stating that "we could talk about bearing-to-know later, over coffee. For now, an anti-oppressive, safe-space classroom was the immediate goal" (Whitlock, 2010, p. 95). While teachers and teacher educators strive to use queer (the verb) pedagogy, sometimes queer (the noun) issues must be taken care of first. While this group valued questioning norms and reading practices, they also emphasized three other modes of practice: (a) queering everyday moments, (b) dialogue, and (c) embodied performance (DePalma, 2010; Ferfolja & Robinson, 2004; Goldstein, Russell, & Daley, 2007; Jacobi & Becker, 2013; Krywanczyk, 2007; Kumashiro, 2001, 2009; Lewis, 2012; Schippert, 2006; Sumara & Davis, 1999; Winans, 2006; Whitlock, 2010).

Queering daily moments means that teachers took advantage of instances in their classroom they could use to call into question normative categories, particularly those of heteronormativity. This is an important strategy "given the limited theoretical potential of queer theory within the seemingly limited spaces of safe schools and equity policy" (Goldstein, Russell, & Daley, 2007, p. 188), which are often well-intended but not particularly critical of norms. Goldstein, Russell, and Daley (2007) suggest that teachers can find queer moments in lessons on homophobic name-calling analysis. For example, students could be asked not only to self-reflect on how they would feel if called these slurs, but also "How am I complicit in perpetuating this system of homophobia?" (p. 193). DePalma (2010) worked with a primary school teacher who drew a picture of a character who wore a dress and a bow in their hair, and wrote "James" underneath,

which troubled students' perceptions of gender norms and led them to a discussion of these in an organic way.

Dialogue allows teachers to blur the boundaries between student and teacher and student and text. It also allows students to work through problems on their own with less influence from the teacher, and thus less enforcement of the norms embedded in the classroom texts and privileged knowledges. Krywanczyk (2007) gave an example from her middle school classroom, stating that when students used "gay" or "fag" as an insult, rather than just telling them such language is forbidden, she had an open dialogue about the words' definitions and allowed students to voice their opinions and questions without fear of retribution. Sumara and Davis (1999), in discussing with students their reactions to the popular novel *The Giver* (Lowry, 1993), learned that their feelings about sexuality were shaped by societal myths, something they may not have learned through more directed questioning. Kumashiro (2009) also encouraged dialogue, as paired with an examination of reading practices, to help students examine multiple viewpoints. Privileging dialogue can be risky as it takes more control from the teacher, but it can lead students into queerer places as they begin to question and disrupt norms within texts, disciplinary knowledges, and their own thinking.

Lastly, embodied performance is a method whereby the teacher uses their own body and experiences to disrupt norms (Lewis, 2012; Schippert, 2006). Schippert (2006) embodied a false identity by addressing her undergraduate students with "I forbid you to pay attention to my penis" (p. 281) to draw attention to the social construction of identities. What makes this different from other embodied performances as pedagogy is that she did not use her own lived experience, for she felt it is "unnecessary to know the personal identity or heart-felt opinions of the teacher" (Schippert, 2006, p. 294). This is in sharp contrast to Lewis' (2012) embodied

performance, who as a feminine-dressing queer black woman did things such as showing a picture of herself on a motorcycle to contradict stereotypes of motorcycles being used only by "butch" lesbians. Lewis (2012) and Schippert (2006) both note the dangers of using the teacher body in this way, the former pointing to the danger of reifying stereotypes rather than disrupting them and the latter noting that it may cause painful self-reflection on the part of the student as well as reading the professor as merely narcissistic. Additionally, I wonder if Schippert (2006) did not use personal experiences because it is, as I have found personally, emotionally draining.

Queer pedagogies in English classrooms. Queer pedagogies have been incorporated in both K-12 (Jacobi & Becker, 2013; Krywanczyk, 2007; Sumara & Davis, 1999) and college-level English classrooms (Winans, 2006; Sarigianides, 2012)[4]. Krywanczyk (2007) used literature to push her middle school students into more complex, nuanced discussions of character identity rather than falling into dichotomous comparisons such as "rich/poor" to allow an in-depth exploration of power. Jacobi and Becker (2013) worked with incarcerated women and youth in a writing program. To queer this restrictive space, they brought in diverse "mentor" texts from sexual and racial minorities and created a "hybrid" text written collaboratively by "residents, facilitators, and staff, attempting to queer the boundaries and power dynamics between these groups" (p. 39). Sumara and Davis (1999) worked with primary school students, teachers, and parents who had conversations about *The Giver* (Lowry, 1993) and used "heterotropic events," meaning the juxtaposition of things not normally found together: in this instance, readers' experiences with characters, plot points, and themes from the novel. Bruce (2013) asked high school students to interrogate the writing standards themselves, and to write

[4] This section will not include texts on LGBTQ inclusion and English classrooms, such as Harris (1990) and Spurlin (2000)

new ones that were relevant to their own lives and needs. Bruce (2013) did not claim queer pedagogy as a tool, but I include this work as it involved questioning norms.

At the college level, Winans (2006) worked with undergraduates in an English course and Sarigianides (2012) worked with Preservice teachers in a Young Adult (YA) literature course. Winans (2006) encouraged her students to "explore their assumptions about sexual orientation and the sources of those assumptions" (p. 115) through reflections on their discourse communities. This allowed them to see the disagreements within these communities, which in turn allowed them to begin to accept the possibility of other ways of being in the world. Sarigianides (2012) took a post-structuralist approach to her course, in which she not only engaged them in conversations about YA literature, but also about the social constructions of adolescence and adolescents, requiring students to question norms and how those norms impacted their ideas on teaching. Though Sarigianides (2012) was not claiming to use queer pedagogy, her encouragement of questioning norms fits within a queer framework.

Limitations and Challenges

Despite the variety of suggested queer pedagogy practices, there are limitations on just how queer a classroom can be. There are always outside limitations on how radical a course can be before there are ramifications, whether those are in the form of student evaluations, departmental reprimands, or worse. But this is why the local is important (Winans, 2006): the realities of lived experiences must be taken into account when practicing queer pedagogy. As Whitlock (2010) discussed, sometimes safe spaces are a more immediate need than questioning norms. If a student is being bullied, it is more important to talk about how school staff can protect them first before deeper discussions of the school's role in perpetuating heteronormativity. Additionally, teachers work under normative structures that cannot be ignored (DePalma, 2010). But by

seeing queer pedagogy as a possibility for a mode of practice, rather than a set of prescribed techniques, there is room for it in all practices. There is also the danger that by focusing on questioning norms broadly, not enough particular attention will be paid to deconstructing heteronormativity.

Another challenge is student resistance. There has been much written about resistance in relation to both social justice education (Kumashiro, 2002) and education on queer subjects (Copenhaver-Johnson, 2010; Kumashiro, 2009). It is inevitable that practitioners of queer pedagogies will encounter resistant students, particularly from students who come from conservative religious backgrounds (Copenhaver-Johnson, 2010; Kumashiro, 2002; Winans, 2006). While there are no easy solutions to resistance, teachers and teacher educators can attempt to build bridges across resistance by being open to dialogue (even when subjects are difficult to broach) while attempting to maintain a balance of focus on both resistant and enthusiastic students. These strategies will not guarantee success, but as teaching is a messy process there will always be issues to negotiate and it is up to the individual to decide which battles are worth fighting for at a particular moment.

Summary

Queer pedagogy is difficult to define, as it comes from the field of queer theory which resists boundaries. Despite this, there are broad underlying tenets, influenced by Britzman's (1995a) early influential publication which asks scholars and teachers to consider what we cannot bear to know. This includes disrupting and questioning norms, limits, ignorance, and boundaries, particularly those involved in heteronormativity. While queer pedagogy is often enacted by those who identify on the queer spectrum and often focuses on heteronormativity, this is not a requirement. Queer pedagogy can be used to question the norms and boundaries of any subject.

This is what sets it apart from pedagogies of LGBTQ inclusion which can sometimes flatten differences as sameness rather than celebrating diverse communities and ways of being (Britzman & Gilbert, 2004; Macintosh, 2007; Mayo, 2007). Because queer pedagogy is broad and theoretical, with much of the scholarship conceptual rather than from classroom practices, the tensions between theory and practice run high. This tension is experienced most by K-12 practitioners, who face more curriculum restrictions and mandated institutional boundaries than teachers in higher education, and so may not have enough professional flexibility to queer their classroom. These tensions are also seen in social justice pedagogy. In the following section, I will describe critical literacy, which holds much potential for incorporating queer pedagogy and social justice as it does not shy away from asking students to consider controversial topics.

Table 3

Queer(ed) pedagogy and curriculum definitions

Author(s)	Definition(s)
Britzman (1995a)	From 3 components of queer theory: study of limits, study of ignorance, and the study of reading practices. Refuses and questions normalcy, includes the practitioner examining their own motives and reading practices, "exploring what one cannot bear to know," risking the self, and creating a world where all bodies matter.
Bryson & de Castell (1993)	2 possibilities for queer pedagogy: 1) Curriculum designed for gay and lesbian students; 2) Queer relations and subjectivities as "deviant performance…[intended] to intervene in the production of so-called normalcy in schooled subjects (p. 298-299)
DePalma (2010)	Allowing questions to remain hanging without needing an immediate correct answer. Seen in "fleeting moments" of everyday classroom experience.
Ferfolja & Robinson (2004)	Calling it "anti-homophobia education:" "pedagogical approaches that attempt to counteract the inequities and damaging impact of homophobia and heterosexism" (p. 11)
Goldstein, Russell, & Daley (2007)	"Queer schools model:" troubles disciplinary knowledges & heteronormativity; teaches the interlocking nature of oppression
Krywanczyk (2007)	Differs from single-issue pedagogies as it "radically recognizes inequalities [as] complex …while simultaneously challenging the foundations of categorical distinctions" (p. 32)
Kumashiro (2001)	1) education for the Other, 2) education about the Other, 3) education that is critical of privileging and Othering, 4) education that changes students and society
Luhmann (1998)	Should be thought of as questions that "encourage an ethical practice by studying the risks of normalization, limits of its own practices, and im/possibilities of (subversive) teaching and learning" (p. 154)
Meyer (2007)	Includes marginalized discourses and allows students to question and challenge binaries. Teachers must question schooling and norms as well.
Quinlivan & Town (1999)	Allows movement from the hetero/homo binary by: "the provision of venues, abnormalizing the normal, dissolving the boundaries and forming alliances" (p. 518)
Weems (2007)	Requires readers—teachers or students—to examine and question textual claims, look at multiple readings of texts, "struggle with otherness," and examine our limits and desires to have "pedagogical boundaries," (p. 203).
Winans (2006)	Questions "how knowledge is created, authorized, and normalized" from a local perspective.

Table 4

Examples of queer pedagogy practices

Author(s)	Practices
Britzman (2012)	Reading for 1) alterity 2) starting a dialogue 2) creating a theory of reading.
DePalma (2010)	1) "Interventions stemming from an LGBTQ rights perspective with a clear social justice agenda" (p. 51), such as rewriting a school's discrimination policy 2) Small moments in the daily routine of teaching that involve "questioning the validity of connections and associations we make automatically, as well as forging new conceptual possibilities" (p. 51), such as drawing a character to look like a "girl" but giving it a "boy's" name
Goldstein, Russell, & Daley (2007)	Queer "moments" that can, with care, lead to a disruption and troubling of normalcy: 1) Youth coming out stories 2) Homophobic name-calling analysis that includes self-reflection
Jacobi & Becker (2013)	1) Allowing students to struggle 2) Use a diverse range of "mentor texts" outside of the canon
Krywanczyk (2007)	1) Intersectional conversations with students 2) Discussing "controversial" and complicated issues 3) Open dialogue and discourse 4) Blurring the lines between student and teacher
Kumashiro (2001)	"Invite students into crisis, and then help them work through it" (p. 20)
Kumashiro (2009)	1) Address hidden curriculum about gender and sexuality 2) Use a variety of lenses to examine issues
Lewis (2012)	1) Uses an autobiographical performative pedagogy of embodiment, meaning her own body and experiences serve as examples, for her queer black feminist pedagogy practices
Luhmann (1998)	2) Asking students to reflect: "What does this information do to one's sense of self? (p. 150). 3) Rather than assuming *identities* trouble how *identifications* are made
Macintosh (2007)	1) Rather than focus only on how to create safe spaces, problematize the reasons these are needed. 2) For new teachers, practice with heated conversations that do not have 1 right answer and require them to be reflective of their positionality and practice
Meyer (2007)	Encourage students to "trouble" what societal assumptions

Table 4 Continued

Examples of Queer Pedagogy Practices

Author(s)	Practices
Miller (1998)	Use autobiography to 1) move beyond standard teacher narratives of gaining enlightenment through practice, to more complex narratives that are messy and unrecognizable and 2) show a variety of sexualities, races, and classes that go beyond monolithic understandings of student and teacher.
Quinlivan & Town (1999)	1) Validating individuals' identities 2) Use a fluid model of sexuality that asks all, including heterosexuals, to question what is normal
Schippert (2006)	1) Using the teacher body as a performative tool, particularly in ways that are not "true" for the individual teacher.
Sumara & Davis (1999)	1) Text discussions with students, teachers, and parents. 2) Heterotropic events- meaning the juxtaposition of things that are not usually together, such as a personal experience with a textual example
Whitlock (2010)	1) Autobiography (from Miller, 1998) 2) Creating a subversive classroom community that allows multiple practices, pedagogies, and expressions of self
Winans (2006)	1) Asking students to examine the discourse communities they are familiar with, and how that affects their opinions of difference and concepts of "normal." 2) Highlighting the conflicts within discourse communities to show how knowledge is unstable 3) Not avoiding topics for fear of students expressing hate or ignorance 4) Moving knowledge and subjects that are normally "on the periphery to the center" (p. 110)

2.3 CRITICAL LITERACY

Critical literacy is a relatively new sub- field; it first gathered steam in the 1990s. It stems from Freirean models of reading the world and the word, and has been embraced by classroom teachers and literacy and education scholars. Critical literacy is something I personally did not have a label for until quite recently, but once I began reading about it I felt an instant kinship with it. Critical literacy describes what I taught in my own classroom and practice in my personal literacy habits. In this literature review I will first give an overview of the definitions of critical literacy and surrounding terms, before outlining various frameworks and models scholars have used to describe critical literacy. Then, I will explore examples of classroom practices, and discuss of the limitations of critical literacy. Next, I will delve deeper into an aspect of critical literacy that is relevant to my own research interests: critical emotional literacy.

Definitions

Literacy is not a neutral field concerned only with texts, but a sociological and ideological construction (Street, 1995; Luke, 2000). As Luke (2000) stated:

> The work of literacy teachers is not about enhancing individual growth, personal voice, or skill development. It is principally about building access to literate practices and discourse resources, about setting the enabling pedagogic conditions for students to use their existing and new discourse resources for exchange in the social fields where texts and discourses matter. (p. 449)

Thus, as many English teachers know, literacy is about far more than learning to read and write, and extends to learning how to engage in the social world.

Critical literacy refers to "the use of the technologies of print and other media of communication to analyze, critique, and transform the norms, rule systems, and practices governing the social fields of everyday life" (Luke, 2012, p. 5). In addition, it is primarily concerned with using literacy for social justice in service of marginalized peoples. Critical

literacy in practice combines "social, political, and cultural debate and discussion with the analysis of how texts and discourses work, where, with what consequences, and in whose interests" (Luke, 2012, p. 5). Visual texts can also be considered from a critical literacy standpoint (Albers, Vasquez, & Harste, 2011). Researchers and practitioners have used critical literacy in the classroom to raise not only their students' social consciousness, but also to call them to social action. Because social action needs differ between and among communities, critical literacy is not a set of prescribed methods or techniques, and is better thought of as a way of thinking (Berhman, 2006; Luke, 2000; McLaughlin & DeVoogd, 2011). Practicing critical literacy also requires self-reflexivity from instructors, and they must teach this skill to their students, as one must always question why you react a certain way to a text, and where these reactions come from.

In addition, Patel Stevens and Bean (2007) offered a clarification between critical reading and critical literacy. Critical reading refers to the skill sets needed for basic literacy, and proponents of this technique believe "meaning resides in texts to be deduced through careful, thoughtful exegis" (Patel Stevens & Bean, 2007, p. 6). Critical literacy, on the other hand, goes farther, and requires readers to "always look behind the text to identify its hidden agendas" based on social and ideological norms (Patel Stevens & Bean, 2007, p. 6). While critical reading seeks to find a single "verifiable reading," critical literacy embraces "multiple plausible interpretations of a text" (Patel Stevens & Bean, 2007, p. 7).

Frameworks and Modes that Impact the Practice and Research of Critical Literacy

Several scholars have offered frameworks which can help researchers and practitioners categorize forms of critical literacy to better understand how they function. One of the more predominant frameworks used in the literature is Janks' (2000) four categories: domination,

access, diversity, and design. She sees these four types as "*crucially interdependent"* (Janks, 2000, p. 178, emphasis in the original) and cautions against using one without the others. Janks (2000) sees the domination category in practice as those who see texts as "a powerful means of maintaining and reproducing relations of domination" (p. 176). Access is a related paradigm, and a contradictory one, working in what Lodge (1997) called an "access paradox" (as cited in Janks, 2000, p. 176). Teachers concerned with access want to make sure students have access to a variety of texts, but worry that giving "access to dominant forms…contributes to maintaining their dominance" and conversely, that if "we deny students access, we perpetuate their marginalization" (Janks, 2000, p. 176). Diversity refers to not only representation of diverse subjects, but to "different ways of reading and writing the world in a range of modalities" (Janks, 2000, p. 177). Lastly, the design paradigm focuses on different ways of creating texts, and "recognises the importance of human creativity and students' ability to generate an infinite number of new meanings" (Janks, 2000, p. 177). These four categories can help both researchers and practitioners examine their own practices to improve students' capacity for conducting critical literacy examinations.

While Janks' (2000) model allows us to categorize critical literacy practices, Luke (2000) discussed a model of the practices themselves, as designed by Freebody and Luke (1990, cited in Luke 2000). These scholars suggested a framework of four over-arching categories of practice: 1. coding practices, 2. text-meaning practices, 3. pragmatic practices ("developing resources as a text user"), and 4. critical practices ("developing resources as text analyst and critic") (Luke, 2000, p. 454). Teachers and researchers can use these categories to label more specific classroom practices (discussed in the next sections), to see if they are favoring one over another, and to locate gaps in their critical pedagogy. This model could be used in tandem with Janks'

(2000) categories. For example, Freebody and Luke's (1990) call for coding practices should be practiced in Janks (2000) model of diversity, teaching students that different text modalities may require different ways of breaking their codes. Students could discuss how the idea of "pragmatic practices" (Freebody and Luke, 1990) can differ depending on how much "access" (Janks, 2000) people have to certain discourses, and what kinds of "domination" (Janks, 2000) these practices reify or support.

While Janks (2000) and Freebody and Luke (1990) remain the most influential, other scholars have proposed further models of examining critical literacy. Heffernan (2004), in his practice teaching writing to elementary school students, found out first-hand that that critical literacy uses a sociological model focused on "social and cultural lives" rather than a psychological model which has an individual focus on "personal lives and interests" (p. 3). Patel Stevens and Bean (2007) noted that one of the necessary modes (which could be placed under "text-meaning practices") is of deconstruction: teaching students how to take apart a text. McLaughlin and DeVoogd (2011, citing their own work from 2004) stated that the principles of critical literacy "1) focus on issues of power and promotes reflection, transformation, and action" (p. 270), "2) focus on the problem and its complexity" (p. 280), 3) examines multiple perspectives, and 4) use techniques that are "dynamic and adapt to the contexts in which they are used" (p. 280). These principals coordinate well with the definitions discussed in the previous section.

To further relate to the idea of geography of critical literacy in practice, Rogers (2002) suggested "locating critical pedagogy in three specific contexts: local, institutional, and societal" (p. 773). It is also important to consider "glocalisation" (Luke & Carrington, 2004, cited in Myers & Eberfors, 2010), meaning the "global interaction of local cultural frames of

interpretation" (Myers & Eberfors, 2010, p. 148). This is particularly crucial in digital literacies, where the global and local are likely to intersect.

Critical Literacy in Print Practices

While critical literacy, as previously discussed, is best thought of as a method or a way of thinking rather than a set of practices, there are some common techniques shared among practitioners that can be adapted to local circumstances. Behrman (2006) found in his examination of studies using critical literacy from 1999-2003 that there were six main student activities employed: "(1) reading supplementary texts, (2) reading multiple texts, (3) reading from a resistant perspective, (4) producing counter-texts, (5) conducting student-choice research projects, and (6) taking social action" (p. 492). These activities may overlap and happen simultaneously. Next, I will share examples from publications after 2003, to illustrate that these practices are still relevant since Berhman (2006) conducted his review.

Behrman (2006) found that for the first category, teachers used popular culture and Young Adult (YA) novels to supplement the curriculum. Wolk (2009) has suggested several YA novels, such as *The Hunger Games* (Collins, 2008), that can be used to teach about a variety of social issues. Simmons (2012) used *The Hunger Games*, focusing particularly on human sex trafficking and hunger. For the second type of activity suggested by Behrman (reading multiple texts), Mosely and Finders (2009) used multiple texts on segregation to show how different people wrote about the topic from different perspectives. Hall and Piazza (2008) suggested that to read from a resistant perspective (Behrman's third category), teachers and students should discuss "what is valued or ignored within a given text" (p. 39). Bruce (2013) took a meta approach to creating counter-texts (Behrman's fourth category), when he had students critique learning standards and then rewrite them to include literacies used in local cultures. Despasquale

(2009) let her journalism students choose a topic for their newspaper (illustrating Behrman's fifth category of student-choice research), and despite some initial discomfort and resistance from the administration, the students chose homosexuality. Lastly, Young's (2009) students in a World Humanities class chose to focus on homophobia, and conducted school-wide events to initiate a school dialogue on the topic (illustrating Behrman's sixth category, social action). The class started a GSA (Gay-Straight Alliance) and had a "Day of Solidarity," where students were encouraged to wear jeans and white T-shirts to show their support for LGBTQ people (Young, 2009). Taken together, these practices can allow students to see "texts themselves [as] manipulable, transparent constructions that can be accepted or rejected, and in which multiple meanings are explored" (Bean & Moni, 2003, p. 846).

Research on critical literacy since 2003 has also focused on additional classroom practices including metalanguage and student-centered dialogue[5]. Luke (2000) noted that in Australia, metalanguage has been a large focus, and that it "ties language to function, text to context, theme to ideology, and discourse to society and cultures" (p. 453). Patel Stevens and Bean (2007) further asserted that metalanguage is essential and helps students "use texts as mediational tools" (p. 26). Students need this language about language to fully critique the way texts are created and the way they can be used to influence others.

Dialogue and critical conversations have been used by instructors from elementary through high school. Aukerman (2012) observed an elementary school teacher who allowed his students to dialogue about texts, and found that these conversations opened up deeper discussions of how the class was perpetuating gender norms. Heffernan (2004) found that "the most significant resource for students was talk. Without an emphasis on classroom conversation,

[5] Self-reflexivity is another important practice, but it will be discussed in "The Importance of Feelings" section

the sociological aspect of students' writing would have been lost" (p. 72). These conversations allowed Heffernan's third grade students to write about issues of racism and gender, and brought a complexity to their writing that he had never before witnessed. Hobson (2009) used Socratic seminars to allow her high school students to dialogue with one another, though she sometimes intervened if the conversation became one-sided or otherwise uncomfortable. Depasquale (2009) asserted that through open conversation "a teacher can encourage students to break down society's barriers" (p. 169), even when they had not been aware of the barriers' existence, or were content with the barriers.

Educators who incorporate queer topics have found dialogue is particularly necessary classroom component (Depasquale, 2009; Jacobi & Becker, 2013; Young, 2009; Vanderburg, 2009). This is likely because as queerness is already considered controversial, a dialogue is necessary to allow students to explore their viewpoints, and to prevent students and administrators from feeling teachers are pushing a "gay agenda." Additionally, for teachers who are also motivated by queer theory, embracing multiple viewpoints is essential. This dialogue also stands in sharp contrast to society's general silence on queer issues (Young, 2009), or as Vanderburg (2009) found when his students read *Middlesex* (Eugenides, 2002), that students who were uncomfortable with non-mainstream sexualities and gender identities tended to have a "critical monologue instead of a critical dialogue" (p. 104). Dialogue also helps students critique norms and binaries, for as Martino (2009) articulated, "reading practices need to address the limits imposed by normalcy in terms of interrogating a conceptual order that refuses to entertain the possibility of the other outside a structure of binary hierarchical identity categories or labels" (p. 393).

As Hall and Piazza (2008) pointed out, to succeed in all of these activities "teachers will want to provide a supportive, nonjudgmental environment that allows students to examine belief systems" (p. 40). Critical literacy practices ask students to be more vulnerable than in conventional literacy classrooms, where they simply need to pick out themes and recall basic information. But as Heffernan (2004) found out in his work with third graders, students are likely to embrace the discussion of controversial topics such as race, as they are not often allowed to discuss them in other spaces. This is also true of queer subjects, and the reason why teachers who are open to discussing queer issues with students are encouraged to display "safe space" signs or stickers in their classrooms.

Instructors using critical literacy hope that their efforts will have a lasting impact on their students. In our current political and social moment, it seems there is no time to waste. In the light of the recent tragic events such as the murders of women by a man spouting misogynistic beliefs in Santa Barbara (Mather & Winton, 2014), these words by Hobson (2009) struck a chord with me:

> If teachers embraced critical literacy, when students encountered repeated story-lines and images in the media about the sexual and physical violation of women, they would be able to deconstruct the hidden messages there, the various representations of relationships between men and women and the potential reification of men as predators and women as objects to be preyed upon. (p. 73)

While I am not suggesting that the answer to all society's ills is critical literacy, I do believe that if more people were critically literate, they would see the systemic problems (in the Santa Barbara case, primarily misogyny and internalized racism) from which such tragedies generate rather than viewing them as individual events, devoid of social context. Recognizing the social implications is the first step of many to social change.

Digital Critical Literacy Practices for the Classroom[6]

Dowdall (2009) offered a definition specifically for critical digital literacy: "a mastery of the wider sociocultural and economic context in which text production in digital spaces occurs" (p. 51). Digital literacy, where students can move through hypertexts on the Internet (online texts with embedded links to other websites) quickly and nonlinearly, has another set of unique practices. While some may want to claim the computer is a neutral device (Fabos, 2008) or that the Internet is a neutral medium (Selber, 2004), as with any text, this is not the case. Furthermore, while some think of online as open space (cyberspace), "online space is never without some structure that dictates ease of movement or interaction" (Marshall, 2008. p. 507). As Selber (2004) noted, "if the Internet is to do more than replicate current structures, teachers and students must look critically at not merely what we talk about and how we talk about it but also at how it was that we reached these decisions in the first place and if we might change them" (p. 85). Selber further offered four "parameters of a critical approach to computer literacy:" (a) design cultures (examining the "dominant perspectives that shape computer design cultures" (b) use contexts, (c) institutional forces that contribute to use, and (d) popular representations "in the public imagination" (p. 96). For Selbers, these parameters will allow students to learn that computers and the Internet are far from neutral, and can in fact be used for manipulation and control.

Several digital literacies scholars have noted that many digital classroom practices focus on using the Internet for information, and focus on teaching students how to be safe online, rather than using the Internet as a communicative and collaborative tool (Fabos, 2008; Thomas, 2008). As Thomas (2008) asserted, students should be taught not only how to be critical

[6] This section will not discuss in detail digital practices of youth, as this is covered in the New Literacies literature review

consumers of information online, but also critical producers. Fabos (2008) has three main criticisms of teaching strategies that only focus on information literacy and website evaluation skills: (a) "*Web-page evaluation strategies are no match for today's Web*;" (b) "*Webpage evaluation practices privilege fact-based assignments and the search for objective truth*;" and (c) "*Information literacy dismisses Internet commercialization*" (p. 858, emphasis in the original). She posited that critical literacy can help with these problems, by teaching students to "critique the Web as a whole, not on a page-by-page basis [and by teaching students] that all discourses are intrinsically ideological" (p. 861). She suggested a three-step instructional technique to counter these pitfalls of information literacy-only pedagogy: 1) "building an ideological framework," (p. 862) where students look through a variety of political magazines to deconstruct their use of discourses, 2) "investigating one issue" that "defies the liberal/conservative or Republican/Democrat dichotomy," such as obesity (p. 863), and 3) "understanding the political economy of information" (p. 864) to learn how commercialization affects the production and distribution of information. Selber (2004), who seems to be in agreement with Fabos (2008), suggested strategies such as examining the ways that "online activities are standardized and controlled" (p. 85) and "to seek oppositional discourses that defamiliarize commonsensical impressions of technology in educational settings…The master narrative of technological determinism binds progress with computers in such a compelling way that teachers are deterred from important questions of agency" (p. 89). As with print-based strategies, determining the author's purpose is essential.

Despite the possible dire consequences of an un-critical approach to digital literacy, the use of digital elements in the classroom does not have to be so serious. As Davies (2009) suggested, online "critical literacy practices [can] arise through creative play, and [become

spaces] where 'preferred readings' are often undetermined" (p. 31). Other more playful and interactive classroom uses of the Internet include communication between students and preservice teachers (Groenke, 2008) and a short story forum between students in the U.S. and Sweden (Myers & Eberfors, 2010). While Groenke (2008) found that her preservice teacher missed several opportunities to engage in critical discussion, Myers and Eberfors (2010) found that in a 'glocalized' classroom, their students were able to consider how their responses to text were informed by their cultural backgrounds. As the authors asserted, "intercultural critical literacy practices require students to examine cultural beliefs and values that frame text meaning and thus negotiate multiple 'partial' cultural truths" (p. 152). Furthermore, they found that their students "went beyond the achievement of an intercultural competence in a second language to the critique of cultural beliefs and values as a purpose for interpretive discussions" (p. 163).

Lastly, researchers have examined the use of hypermedia to allow student agency, and others have examined its use in critical literacy. While I will not go into detail about hypermedia here (as it will be examined in the New Literacies literature review), I will simply end this section with thoughts from Myers and Beach (2001) on the value of this practice:

> As students use hypermedia authoring tools to focus and juxtapose particular words, images, symbols, and sounds, they can generate critiques of the ideologies that define their contested meanings and shared social lives. Within such a critical literacy practice, hypermedia authoring constructs the critical consciousness and agency required to transform the texts of our lived and represented world. (p. 544)

Limitations and Challenges

While critical literacy can cause students to think deeply and broadly about the implications of a text, this is not always accomplished in practice. Janks (2000) found that while her participants knew how to conduct an oppositional reading to look for what was absent in the text, they "had not learnt how to use the full range of discourses that they had access to" and were instead relying on their "dominant deconstructions" based on racism and sexism (p. 181).

If teachers have focused on certain kinds of marginalization, their students will as well, and may miss other forms of oppression present in a text. Luke (2000) further speculated that critical literacy "might make one just literate enough to get in real trouble… to read contexts just enough to be ideologically deceived" (p. 455). Teachers may also unconsciously use critical literacy practices as a way to reify their own personal beliefs, rather than allowing students to engage in a dialogue to explore multiple beliefs about a subject. School-level restrictions, such as a focus on testing, can also lessen the amount of time teachers can focus on critical literacy (Mosley & Finders, 2009). All of these factors can prevent critical literacy from being a transformative experience as it is intended.

Furthermore, student investment can limit the impact of critical literacy. Students may be cautious of sharing their views after a critical reading of a text, worried about what their peers will think of them (Mosley & Finders, 2009). Depasquale (2009), in her work with her high school journalism class on homosexuality, got pushback from administrators and other faculty about the choice of topic. Her students' interest waned as the controversy made them unsure why they were writing about the topic in the first place. Rogers (2002) suggested that teachers first "ask students to critique images, examples, and texts that connect to issues that are close to their immediate lives but that do not include their own lives" (p. 786), to help avoid the resistance that can lead to a lack of investment.

Teachers may also try to engage student interests in a superficial way by choosing texts based on their students' race and gender, which can lead to ignoring the more nuanced and complex ways students' identities are formed (Thomas, Hall, & Piazza, 2010). For another example, teachers may try simply including texts that include queer characters, but fail to tackle these topics in discussion. This inclusion-only strategy does not lead to critical literacy practices,

and may actually serve only to reinforce students' misconceptions about homosexuality as a secret, or depending on the texts chosen, may reinforce stereotypes of queer people (Banks, 2009; Martino, 2009). This is one reason "McLaughlin and DeVoogd (2004) warned that "critical literacy practices should not be exported from one classroom to another without local adaptation" (as cited in Behrman, 2006, p. 490). Behrman (2006) cautioned, in his review of critical literacy classroom practices, that he found no evidence of true collaboration, and asserted that "teachers and teacher educators must confront the question of whether any pedagogy that presumes a hierarchical relationship between teacher and students truly supports the development of critical inquiry" (p. 496). This question seems impossible to answer, given that there will always be a power differential between teacher and student in our current system.

Critical digital literacy has its own set of challenges due to particular features of digital media. Warnick (2002), in her examination of digital media, found that:

> Because of such features as digital pastiche, source anonymity, and fan out, some forms of new media are particularly prone to fool and mislead those users who cannot distinguish between facts and 'real news' on one hand and fabrications on the other. (p. 11)

Selber (2004) found that the design and aesthetics of websites lead users to decide if a source is reputable or not, and if a site has a professional look many will not investigate its credibility. There is also a widely-held view of the Internet as a neutral place, one that can work as a "democratic tool for spreading ideas" (Fabos, 2008, p. 840). Another limitation is that educators are eager to teach students how to use the Internet for research, but are less open to using the Internet as a participatory practice or a place to find community, despite the current popularity of Web 2.0 sites which encourage these traits (Thomas, 2008). Fear of cyberbullying and sexual predators convinces teachers that they should keep students' use of the Internet at a 'safe' distance.

Lastly, there are political challenges to using critical literacy in the classroom. McLaren (1992) cautioned that Freire's work in practice "runs the risk of being reconfigured by liberal educators who would hold him captive as a benevolent father to be venerated because of his experiential 'method'" (p. 9). Street (1995) stated that the U.S. has an obsession with literacy, making it a straw man which draws focus away from other problems such as poverty and racial inequality. Street (1995) further asserted that:

> The signification of literacy has, then, to be decoded not simply in terms of a discourse around education…but in terms of discourses of nationalism: it is around the concept of nation and national identity that the social issues currently diverted into the literacy debate essentially focus. (p. 125)

While Street (1995) was discussing literacy in general and the potential for New Literacy Studies rather than critical literacy practices, his point has weight in this discussion. It is possible that by focusing on critical literacy, teachers can guide students into seeing these larger problems, and become agitated enough to take social action.

The Importance of Feelings

Because critical literacy is about reading the world, and this is a very personal practice, critical literacy cannot be separated from identity and emotion. This is important, because critical literacy allows students to "become more aware of their views and how their views influence their interpretations of texts and interactions with people" (Hall & Piazza, 2008, p. 32). By engaging in critical self-reflection, participants in critical literacy can investigate not only what their feelings and identity feel like, but from where these pieces of themselves generate. This is true not only for students, but for teachers as well. Perhaps a broader inclusion of emotion in critical literacy practices can help counter some of the limitations and challenges noted previously, especially those related to student resistance and investment.

Identity is understood by many theorists as "a process rather than a unified category" (Patel Stevens & Bean, 2007, p. 28). As Patel Stevens and Bean (2007) explained:

> We can think of identity as fluid and shifting based on contextual feedback and individual interpretation…How we understand ourselves is… informed by where we find ourselves, with whom, and engaged in what practices…As a social context, the classroom is marked by participants interacting with each other, performing their senses of selves, and interpreting others' actions and practices. As we read texts together, we are engaged in socially situated literacy practice, with implications of identity construction and power. (p. 25)

As critical literacy as a concept assumes that literacy is a social practice, it follows that identity will have an impact on how it is taught and received. One example of using identity in the classroom is the program Ashcraft (2012) observed. Here, where facilitators addressed sexuality with youth, Ashcraft (2012) found that through dialogue students could explore and question sexual identities. Ashcraft (2012) found that moments of "fragile interruption," where the conversation was spontaneous and messy, were the most powerful for the students. This fits with other instructors' assertions (such as Heffernan, 2004), that conversation was the most powerful teaching tool for students.

Digital and other new literacies can allow students to incorporate and explore their identities in the classroom. Myers, Hammett and McKillop (1998) found that students were "creating resistant readings by juxtaposing multimedia texts, and beginning to examine the underlying ideologies of power that support dominant and alternative representations, [allowing them to] initiate the potential transformation of identity through the process of reinterpreting textual meaning" (pp. 73-74). Online spaces also allow youth to engage in their social identities, sometimes playing with multiple ones (Dowdall, 2009; Thomas, 2008). Additionally, online participatory cultures allow users to find community with those who share "similar aesthetic, social, and political goals" (Wohlwend & Lewis, 2011, p. 190). This can lead to social action, "symbolized through the discourses of giving, contributing, and sharing" (Thomas, 2008, p.

687). However, Internet use is not always positive, as "the new found freedom [online] and seeming lack of consequences also resulted in some cases where users were reported to be more aggressive and to be more overtly critical or even cruel to others" (Thomas, 2008, p. 674). While teachers can encourage students to explore their identity online, they should also discourage them from using their online anonymity to hurt others.

For some teachers, critical self-reflection on highly emotional experiences motivated them to embrace critical literacy in their instruction. Ellis (2009), motivated by her response to a student whose murder was a homophobic hate crime, used critical literacy as a way to "work for personal growth in [a] meaningful and socially critical way" (p. 55). Hobson (2009), a high school teacher, found that she needed critical literacy after two tragic events: 1) watching the twin towers collapse on 9/11 with her students, and 2) learning of an 18-year old senior girl at her school who ran screaming from a final, having suddenly recovered her memory of being raped at the prom a few nights before. Heffernan (2004), a third grade teacher, found he was hesitant to read a book on slavery with his students as he had a strong emotional reaction to it. But when he helped his daughter with a research project on milk, he learned that during the same time period slaves were brought to the U.S. in horrible conditions, cows were shipped over in clean individual stalls. This juxtaposition made him feel he was doing his students a disservice but not sharing difficult topics with them, and despite his worry for their emotions he found "the students were not traumatized—they were engaged and serious as they talked about slavery and racism" (p. 6). This new class focus not only improved student writing, but lead him to feel he was an activist as well as a teacher.

What these teachers were engaged in along with their self-reflexivity, without naming it as such, was critical emotional literacy (Zembylas & Vrasidas, 2005; Stylianou-Georgiou,

Vrasidas, Christodoulou, Zembylas, & Landone, 2006). As explained by Wohlwend and Lewis (2011), "emotion often reveals underlying ideologies through an act of intensely involved participation or immersion that results in important understandings about texts and discourses" (p. 192). While critical emotional literacy is described as an aspect of criticality in Information and Communication Technology (ICT), it seems highly applicable to print-based forms of critical literacy as well. Zembylas and Vrasidas (2005) defined critical emotional literacy as:

> Analysing and critiquing the ways in which ICT encourage certain emotions and ideologies and prohibit others. The difficulty in developing critical emotional literacy is finding out how emotions are manipulated by ICT. This creates two primary challenges for an educator: to deal with the partisan character of the Internet and what it teaches, and to learn how to problematize the ways in which ICT serve as a form of cultural and emotional pedagogy or hegemony. (p. 74)

Stylianou-Georgiou and colleagues (2006) noted that critical emotional literacy occurs in a "pedagogy of discomfort [which] requires that individuals step outside of their comfort zones and recognize what and how one has been taught to see (or not to see)" (p. 29). They further noted that this pedagogy requires students to question their personal beliefs and be open to other beliefs, acknowledging that criticality is not only a way of thinking but also a way of *feeling and being*" (p. 29, emphasis added). Zembylas and Vrasidas (2005) also suggested two related strategies that can assist students in maintaining a critical stance online: collective witnessing, "a collectivized engagement in learning to see, feel, and act differently" p. 76) and collective intelligence, "a continuum developed through collective discussion, negotiation, and imagination" (p. 78). Again, while these may be particularly useful online, based on the literature of critical literacy in classrooms, these strategies exist in the physical world as well, particularly when students and teachers are working together to consider a complex social problem, such as in Heffernan's (2004) third grade class.

These three elements-- critical emotional literacy, collective witnessing, and collective intelligence—require vulnerability from all participants. This is risky for both students and teachers, but the research shows that the rewards of student engagement and learning are worth these risks. An understanding of these elements may have helped Hobson (2009) from feeling so helpless and out of control after 9/11, as Zembylas and Vrasidas (2005) pointed out that after such highly charged events "it is difficult and painful to see how such emotions as anger and indignation—expressed in the media and the Internet—are potentially *mis*-educative, especially when many individuals find comfort in the solidarities created by the emotions" (p. 75). Though investigating the representations of 9/11 (or rape culture) in the media immediately following the event would likely have been difficult, perhaps by focusing on a critical view of these representations Hobson and her students' grief could have been redirected. Perhaps critical emotional literacy can help critical literacy practices be truly transformative, as it can focus self-reflexivity techniques so that one can at least carry out action that effects one's personal beliefs.

Turning back to Heffernan's (2004) students, he found that "the emotional aspect of [their] conversations contributed to the quality of the social-narrative writing that the students ultimately produced" (p. 43). Without this emotional connection, when they were merely working with personal narratives about interests, their writing was flat. He also noted that the discussions brought the classroom community closer together, showing evidence of "collective witnessing" as the students grappled with difficult topics and how they reacted emotionally to them. This witnessing of the text on slavery allowed the white students (who were the majority) to better appreciate stories from their non-white classmates, who shared their own experiences with racism at school through their class discussions on race. From this collective witnessing

and critical emotional literacy, a "collective intelligence" was built, as students were more aware of racial identity as well as the effects this had on individuals in their school community.

Critical emotional literacy, when thought of as more broadly applied than the realm of online communications, could also help the "gay panic" that prevents some teachers from incorporating queer perspectives and subjects into their teaching. Martino and Cumming-Potvin (2011) found that elementary school teachers were afraid of both negative parental responses and encouraging gay sexual behavior in young children when asked if they would include literature depicting gay and lesbian families in their classrooms. Young (2009), whose students faced administrative resistance when they wanted to conduct all-school events supporting gay rights, could have used critical emotional literacy to examine the causes of the school's paranoia. By investigating the ways in which dominant conservative discourses emotionally manipulate media consumers, the students could have used this information to help make their case for their "Day of Solidarity." It could have helped Vanderburg's (2009) students reading *Middlesex*, who were "so lost in their prejudice and so busy questioning Eugenides that they never questioned their values and beliefs" (p. 104). Critically examining how one's beliefs and emotions have been influenced by media can help one decide if these beliefs truly resonate, or if they have merely been adopted from blind consumption.

Critical emotional literacy could also aid in the queer project of resisting normalization. For example, as Sykes (2011) pointed out, "focusing solely on same-sex issues can, in fact, be a normalizing process" (p. 424). Using critical emotional literacy within a critical literacy framework, students could think about what emotions are evoked when looking at advertisements depicting safe, mainstream-appearing gay and lesbian couples in ads promoting (prior to the national legalization of same-sex marriage on June 26, 2015) and celebrating

marriage equality (the June 26, 2015 ruling). From here, they could explore why the creators wanted to evoke these particular emotions, who is left out in these depictions, and what are the possible lasting societal effects of such objects. Critical literacy and critical emotional literacy seem a natural pairing to create what Martino and Cumming-Potvin (2011) called a "queer-infused critical literacy framework" (p. 499). With the addition of critical math, these frameworks can expand the boundaries of what counts as text and help students interpret signs that many see as concrete.

Summary

Critical literacy is an intentionally political pedagogy that teaches students to critically examine texts (both traditional and digital) to discern the systems of power and dominant narratives they represent. Luke (2000) is one of the leading scholars in the field, and Luke and Freebody's (1990) four-dimension framework of practices (coding, text-meaning, pragmatic, and critical) are used by scholars and classroom teachers. Janks (2000), another leading scholar, developed four paradigms to analyze critical literacy practices: domination, access, diversity, and design. Classroom practices common in critical literacy include reflection, reading multiple and counter texts, student-driven activities, and social action projects (Behrman, 2006). Because many critical literacy scholars advocate for student-centered learning, as well as critically examining power structures, both social justice and queer pedagogy mesh well. Boundaries become blurred (queer pedagogy) when students are at the center, and giving students choices can increase their engagement and make any social action projects (social justice pedagogy) more fruitful for all involved. Critical literacy also goes hand in hand with critical math, as each has similar goals within their specific subject matter. In the next section, critical math will be explored in detail.

2.4 CRITICAL MATH

Critical math is a relatively new field, beginning in 1989 with Mary Frankenstein's textbook about her work with adult community college students, and Skovsmose's (1994) work in Denmark with high school students. Like other critical theories, it stems from Freire's work and has a strong commitment to social justice. The main underlying tenets of critical math are that math should be used to "read the world," is not a neutral subject, should be relevant to students' lives, and encourage them to take action for social justice. In this literature review, I will begin by discussing the different definitions of critical math and related terms, and then the models and frameworks scholars use to conceptualize critical math. Then I will outline teacher practices and student outcomes as discussed in the literature. Next, I will discuss the challenges identified by critical math scholars, and lastly discuss implications for my dissertation study.

Definitions

There are other terms related to critical mathematics that are worth discussing before defining the term itself. "Dominant mathematics" is the opposite of critical mathematics, referring to the "math that is believed to be neutral and static, [and] is involved in making sense of a world that favors the views and perspectives of a relatively elite group" (Gutierrez, 2002, pp. 150-151). Critical mathematics practitioners believe there is no neutrality, and that math is a social process and construction (Whitin & Whitin, 2011). Reform mathematics (RM) is sometimes conceptualized as critical, but Gutierrez (2002) stated that many times it merely teaches math in a different way, rather than encouraging students to think differently about mathematics itself. Ethnomathematics was defined by D'Ambrosio in 1978, and uses the cultural forms of "ciphering, arithmetic, classifying, ordering, inferring, and modeling" (as discussed in Aslan Tutak, Bondy, & Adams, 2011, p. 68) from non-Western groups, working to

take away the assumption that Europeans are the gatekeepers of mathematics. While it has similarities with the goals of critical math, in that both strive to serve marginalized groups, ethnomathematics does not necessarily involve a critical, political stance. Democratic mathematics was advocated for by Carnevale and Desrochers (2003), which posits that math should be attuned to the needs of all students. This literature review only includes literature that specifies it is about critical math or math for social justice, and so does not include detailed investigations into studies on ethnomathematics or culturally relevant mathematics that do not also encompass a focus on social action, such as the "algebra project" (Moses, West, & Davis, 2009) that taught algebra in culturally relevant ways to African-American students.

As previously stated, Frankenstein and Skovsmose were the first scholars to practice and write about critical math. Skovsmose (1994) proposed using the term mathemacy as an equivalent to literacy, and saw it as "a necessary condition in today's society" (p. 38). This is also called quantitative literacy (Wiest, Higgins, & Frost, 2007; Root, 2009). Skovsmose (1994) proposed that:

> *If education, as both a practice and a research, should be critical it must discuss basic conditions for obtaining knowledge, it must be aware of social problems, inequalities, suppression etc., and it must try to make education an active progressive social force*. (p. 37, emphasis in the original)

Frankenstein (1989) defined critical math similarly, as "understand[ing] mathematics in a way that will enable you to use that knowledge to cut through the 'taken-for-granted' assumptions about how our society is structured and to act from more informed choices about those structures and processes" (as cited in Aslan Tutak, Bondy, & Adams, 2011, p. 68). Critical thinking is required to achieve this, which pushes students to "incorporate prior knowledge, mathematical reasoning and cognitive strategies to generalize, prove, or evaluate unfamiliar mathematical situations in a reflective manner" (Glazer, 2001, p. 13) and it occurs most in unfamiliar

situations. Critical mathematics, as with other critical pedagogies, does not believe in comfort over learning.

Gutstein is the leading scholar in critical mathematics today, and he defined the objectives of teaching math for social justice as (a) reading the world through math, (b) developing mathematical power, and (c) developing a deep motivation and interest in math for students (Gutstein, 2003). These goals are part of how he defines teaching social justice: "helping students develop sociopolitical consciousness, a sense of agency, and positive social and cultural identities" (Gutstein, 2003, p. 66). Every article about critical math, after Frankenstein (1989) and Skovsmose (1994), cites Gutstein. Gutstein calls his work critical math or teaching for social justice, and it is also referred to as reformist critical math (RCM) (Brantlinger, 2013). McGee and Hostetler (2014) stated that:

> Teaching mathematics for social justice is concerned with the social and political contexts of schooling and pedagogy and contributes to the greater educational needs of equity and social justice. Teaching mathematics for social justice remains mindful of the dominant social and educational contexts within which marginalized students of diverse racial and class backgrounds operate, and at the same time attempts to meet the learning objectives by positioning mathematics as a tool to reshape the opportunity structure in which students must participate. (pp. 212-213)

Throughout the literature, critical math is used interchangeably with math for social justice, and so I will do the same. Sometimes, it is also used interchangeably with culturally relevant math.

As with all teaching for social justice, math for social justice is not without its difficulties. As Root (2009) noted, in quantitative practices "the value that individuals place on different situations cannot be altered, but connections between actions and results can be modeled and investigated" (p. 39). Critical math is an attempt to create these connections. Many practitioners and researchers in the field also note that teaching for social justice should encourage students to become leaders who use these connections for broader social goals (Gregson, 2013; Lucey & Tanase, 2012; Gutstein, Lipman, Hernandez, & de los Reyes, 1997)

Models and Frameworks

Scholars have posited different frameworks for practicing and assessing critical math. Gutierrez (2002) saw equity in math as having three parts: (a) not being able to predict student achievement in mathematics based on their identity, (b) not being able to predict students' ability to conduct mathematic reasoning based on their identity, and (c) eliminating inequalities between people and mathematics. When Gutstein and colleagues (1997) worked together at a K-8 school populated primarily by Mexican immigrants, they used a three-part model to inform their curriculum: (a) critical thinking, (b) honoring student knowledge, and (c) examining teachers' orientations to students' culture and experience.

While these conceptual models were framed around the teachers, Frankenstein (2005) and Bernard Martin and McGee (2009) focus on the students. Frankenstein (2005) stated that the four intertwined goals of critical mathematics for students are: (a) understanding the math, (b) understanding the mathematics of political knowledge, (c) understanding the politics of mathematical knowledge, and (d) understanding the politics of knowledge. Bernard Martin and McGee (2009), in their discussion of critical mathematic curriculum designed for African-American students, asserted that "any relevant framing of mathematics education for African Americans must address both the historical oppression that they have faced and the social realities that they continue to face in contemporary times" (p. 210). While the authors point out that practitioners must also ensure they are not essentializing African-American experience as one of hardship, they advocate for the use of critical race theory (CRT) in mathematics. Bob Moses's Algebra project (Moses, West, & Davis, 2009) was one such project, which specifically targeted African-American children and taught algebra in culturally-relevant ways. The Algebra project was framed after the Civil Rights Movement, and saw the language of mathematics as a

"conceptual language that no one speaks… [but that] can be accessed through ordinary language" (p. 247). Whitin and Whitin (2011), in their discussion of critical literacy and mathematics, suggested using Freebody and Luke's (1999) four dimensions of critical literacy practice in mathematics as well: (a) coding, (b) text-meaning, (c) pragmatic, and (d) critical. There are less frameworks and models of practice in critical math than in critical literacy research, but this is likely because the field is newer and has fewer scholars. It is likely more common for teachers to include critical literacy in a standard K-12 curriculum than critical math. As previously discussed, many still believe math is a neutral topic, so it is less likely for practitioners and school administration to support critical mathematics in the classroom.

Teacher Practices

Because most of the literature on critical mathematics is focused on preservice or in-service teachers, there is more evidence of what the teaching practices of critical math look like than student outcomes. Many of the common teaching practices are found in other critical pedagogies, such as self-reflection (Skovsmose, 1994), dialogue (Gutstein, 2003; de Freitas, 2008; Hand, 2012), creating coursework with students (Gutstein, 2003; Brantlinger, 2013), and even co-creating assessments with students, in Frankenstein's (2005) case. And most prominently, critical math practitioners want their students to gain a critical mindset; to become social change agents; and do so by connecting students' lives to mathematics. To see some examples of specific math content covered through critical math courses, see Table 5. Several practitioners used a text called "Mathematics in Context," which though it "does not encompass a critical approach to knowledge in general, it does contain seeds of this approach" (Gutstein et al., 1997, p. 718). It is up to the teacher to foster these seeds and encourage critical inquiry through mathematics.

Some practices viewed by critical math researchers resonate within a queer pedagogical framework. A practice Frankenstein (2005) mentioned, that is different from other practitioners, is a non-linear way of teaching that stemmed from her planned math skill of the day as students asked questions. She specified that she would give them a preview of a more advanced skill if it came up in their discussion, and then get back to the lesson at hand. She even shared math education research with her students, so they understood what their prior teachers had been doing, which in turn could help them understand why they had not previously been successful in math classes. This was empowering to the students, and created a level of boundary dissolution that is similar to queer pedagogy. Another practice that blurs boundaries was when teachers "periodically de-stabilized predictable conceptual boundaries between 'mathematical' and 'non-mathematical' activity [which] extended the domain of mathematics beyond that prescribed by textbooks and tests" (Hand, 2012, p. 241). Lastly, Ukpokodu (2011) noted that in culturally relevant math multiple perspectives are appreciated, and that teachers have to be open to more than one right answer, which is a departure from traditional mathematics. While this in itself is not queer, if teachers took this further and questioned why there is the norm of only one answer for a math problem, or only one way to solve it, this would be queer pedagogy.

Gutstein and colleagues (1997) saw critical math as part of a larger dedication to critical pedagogy, and maintained that this was witnessed in the day-to-day organization of classrooms. These teachers taught students to question authority, including that of their teachers, and were "giving students tools necessary for active and conscious participation in society" (Gutstein et al., 1997, p. 721). While the teachers at the K-8 school where Gutstein worked valued their students' Mexican culture, and sought feedback from parents and community members, this respect did not prevent them from challenging their students to question "gender roles, adult-

child interactions, and the relationship of the community to the broader society" (Gutstein et al., 1997, p. 729). Teachers also valued their students' heritage language, and in bilingual classrooms helped students develop the language skills necessary to discuss math in English and Spanish. Through this study, Gutstein and colleagues (1997) found that their criteria for what counts as math for social justice expanded to include not only specific mathematical knowledge, but also the ways teachers conceptualized their practice. In this case, the teachers discussed "the relationships between teaching mathematics and producing leaders among students from a marginalized group" (p. 732). The importance of cultural relevancy in critical mathematics was echoed by Leonard and colleagues (2010), Moses and colleagues (2009), and Bernard Martin and McGee (2009).

Gutstein (2003) also talked about leadership and student empowerment when he taught a math class at the school where he was researching teacher practices. He felt that the practice that was most beneficial to students' social justice mindset was "cocreating a classroom environment in which they discussed meaningful and important issues of justice and equity" (p. 67). These concepts of blurring the lines between student and teacher, and the heavy reliance on dialogue, mesh with queer pedagogical practices. In a further meeting of the two modes of practice, Gutstein (2003) also noted that it was the "interrelationship of the goals of teaching for social justice and the students' deeply felt emotions and values allowed us to create together a classroom in which they could study real-life, relevant issues and develop mathematical power" (p. 68). This value of emotions is also found in queer methodologies, and in critical emotional literacy, as previously discussed.

Student Practices and Outcomes

Students' math practice is related to their mathematics identity, which Martin (2000) defined as "(a) ability to perform in mathematical contexts, (b) the instrumental importance of mathematical knowledge, (c) constraints and opportunities in mathematical contexts, and (d) the resulting motivations and strategies used to obtain mathematics knowledge" (p. 19). Gutstein and colleagues (1997) pointed out that developing this identity should include mathematics instruction in students' language to value their cultural knowledge, while also teaching them how to be successful in the dominant culture. This is likely why critical math scholars have worked to create culturally relevant mathematics specifically for racial and ethnic minorities, such as Latin@s and African-Americans.

As previously stated, most research on critical math focuses on teachers, so there is little in the literature about what it looks like when students are participating in a critical math course. Furthermore, as a critical mindset requires action, it is likely difficult for researchers to know that students are taking social action outside the classroom. As Gutierrez (2002) pointed out,

> just because students show the ability to … develop mathematical practices in school that allow them to analyze and critique aspects of society does not necessarily mean they will resist normative patterns or make significant changes in the relationship between people, mathematics, and the planet. (p.164)

But some teachers, as found by Gutstein and colleagues (1997) and Gregson (2013), noted that students become leaders in their classroom, and see this as fostering future socially-just adult activists. Hand (2012) noted that the teachers in her research saw successful student behavior as "taking up space," even if this meant resisting the activity, which can also be viewed as a form of leadership.

Gutstein (2003) offered the most concrete method of assessing if students were successful in practicing critical mathematics. As he stated:

> My criteria for evidence of reading the world included that students used mathematics as a tool to analyze social issues like racism and other forms of bias and to understand power relations and unequal resource allocation in society. I looked for signs that students used mathematics to scrutinize representations of reality (like maps) and to link them to issues of injustice. My criteria also included that students looked for relationships between various social issues we studied. Consistency of their ideas was less important, because the situations were complex and because middle school students are just beginning to more deeply form and articulate their ideas about the world. (p. 50)

To give a concrete example of the messiness of these criteria, Gutstein (2003) explained that when he taught a unit on racism and housing prices, he asked students to formulate their own ideas based on real data. Sometimes these students would come up with completely opposite answers for what showed racism, but both groups could justify their answers with the data, illustrating the complexity of real-life math problems. While this complexity does not lead to a linear progression of a critical mindset, this is okay, and reflects the real world that Gutstein wishes them to read. Through these contradictions students were also able to construct and solve their own problems, causing them to develop both mathematical power and to change their attitude towards mathematics.

Gutstein's (2003) criteria can also be applied to Skovsmose's (1994) early critical math work in Denmark. When Skovsmose (1994) asked his students to create an algorithm to decide how to distribute government funding for families, they were also faced with many contradictions. The students discovered, through their own mathematical inquiry, that the current model was insufficient. They experimented on their own, creating models and algorithms until they found one which resulted in successfully allocating all the available funds. This gave them a broader awareness of how the government's model was "insufficient and imprecise" (Skovsmose, 1994, p. 43).

Terry (2010), who worked with high school Black males on a summer project, also found his students working through contradictions. The students investigated the data on the number of

Black males in college as compared to the numbers in prison, and found that the numbers were different in their community as compared to the nation. Because the students had been asking community members what they felt about the national numbers, and then used these questionnaires for further analysis, the students felt their interview data was skewed and were hesitant to use it. Though the students struggled, their attention to discrepancies in the data, and questioning of the accuracy of a so-called national data set, proved they were developing a critical mindset. Terry (2010) also had first-hand reports from students that this project changed their thinking about what it is possible to do with mathematics.

There is clearly more work to be done focusing on specific student outcomes from critical math pedagogy. There is also space to consider other criteria to assess student outcomes. Glazer (2001) offered a rubric to assess critical thinking in mathematics (Figure 3) that could be adapted to include social justice. Perhaps a strand for "demonstrates the connection between real-life and mathematics" or "demonstrates the need for social action through mathematics" could be added. While it is debatable if this rubric is the best option (how easy is it to assess "thoroughness of solution?"), this is the most concrete suggestion I have seen for teachers in examining the critical math literature. The primary concern with answers --"thoroughness of solution," "organization of solution," and "correct reasoning and justification—than with critically exploring the power relationships illustrated by numbers or leaving room for ambiguity makes it less aligned with critical math tenets than perhaps the author intended.

Grading Rubric for a Project that Promotes Critical Thinking

Criterion	Excellent	Fair	Poor	Points
Correct Reasoning and Justification	15 12	9 6	3	_____
Appropriateness of Mathematical Techniques	10 8	6 4	2	_____
Thoroughness of Solution	5 4	3 2	1	_____
Organization of Solution	5 4	3 2	1	_____
Demonstration of Reflective Thinking	5 4	3 2	1	_____

Figure 3. Glazer's (2001, p. 23) rubric

Challenges

As with all methods of teaching for social justice, there are many challenges to this work. Some of these challenges are standard, such as a focus on standardized testing (Leonard & Moore, 2014), teachers being hesitant to discuss 'controversial' topics in the classroom (Bartell, 2013), the risk of reifying stereotypes rather than challenging them (McGee & Hostetler, 2014), are a lack of models (Ukpokodu, 2011), and an underlying belief in teacher educators that mathematical talent is inherent, and that certain groups such as African-Americans, have naturally lower abilities (Jett, 2013; de Freitas, 2008). Ukpokodu (2011) also noted that many math courses are driven by a district-specified textbook, and teachers do not feel they can deviate from it. Another problem specific to math is the notion that it is politically neutral (Gutierrez, 2002) rather than a social construction. Critics have also stated that critical math is more about raising students' self-esteem or discussing controversial topics than academic rigor (McGee & Hostetler, 2014). Furthermore, just because a mathematics teacher is dedicated to social justice, and focuses on marginalized populations in their work, does not mean they will foster this same sense of social justice in their students (see work on culturally relevant mathematics, such as Jones, 2003). Perhaps because critical math is still relatively new, there are as many challenges as proven solutions.

There are also critiques from within the critical math field. Gutstein and colleagues (1997) found that even teachers attempting to engage in culturally relevant mathematics were not always critical, and despite their good intentions had a deficit orientation towards students. This manifested as (a) "perceiving that the student's family does not support her or him sufficiently and therefore someone needs to step in" (p. 727), (b) not challenging students with rigorous content, and (c) having a romantic idea of student culture. Gutstein (2003) also found himself sometimes simplifying the math in order to get students to broader social justice ideas sooner. Adair (2008), in her critique of Gutstein's work, found that he did not use Freire's critical theory enough, in that Gutstein did not involve parents and community in his work.

Brantlinger (2013) and Bartell (2013) have written compelling accounts of the challenges faced in practicing critical mathematics. Brantlinger (2013) was a student of Gutstein's and taught remedial mathematics at a Chicago night school. While he was committed to using critical mathematics, he had difficulty relating "geometry topics as the Pythagorean theorem and properties of polygons [to] messy real-world data about social realities" (pp. 1062-1063). He also had difficulty getting students to see past stereotypes. For example, when students examined a chart that showed the more white students a school has, the more likely they are to have recess, some students claimed that students of color were bad and so did not get recess. While some students made critical statements about the systemic racism inherent in the numbers, other students never made this connection. Brantlinger (2013) felt that he had to do more explaining of the numbers than he would have preferred, which in his view diminished the effects of critical mathematics.

Bartell (2013) found some troubling results when she observed secondary teachers in a graduate class who were tasked with planning and teaching a math lesson involving social

justice. One group had a member who was very resistant to discussing race, claiming it too controversial for a math class. Yet when the group picked the topic of comparing the cost per day of a prisoner versus a student, race could not be ignored. Bartell (2013) was shocked to find that the teachers considered their lesson a success simply because students were discovering disparities in spending. However, students left the lesson with problematic and stereotypical ideas, believing that because black people are doing bad in school, they are going to prison; or black people are poor and so don't care about school. The teachers were surprised when this was pointed out to them. Another group was more successful at incorporating a critical framework into their lesson, as they were more comfortable with the discomfort of teaching for social justice, but they too had difficulties. These teachers had students compare minimum wage to a living wage. They all said they were seduced the by the "lure of multiple solution strategies to the same problem" (p. 156) and felt they did not get to the main social justice point of their lesson: that everyone should earn a living wage.

A large challenge for critical mathematics is the lack of possibility for practice or to create new models for inservice and preservice teachers. This can lead to a lack of depth and uncertainty in practice. Jones (2003) found that when she tried to engage white teachers in discussion about race, class and gender, they made insightful comments, yet there was a disconnect between their knowledge and their interactions with non-white students in their math classes. Lucey and Tanase (2012) noted that when math teachers collaborated with teachers of "science or social studies that the results are typically limited to simple graphical representations that illustrate commonly accepted scientific theories or social relationships" (p. 8). Bernard Martin and McGee found that much of the critical math work with African-American students have a problematic focus on achievement gaps, believing that these students are at the bottom of

a hierarchy, rather than critiquing the social construction of this hierarchy and the achievement gap itself.

As with research on practices, most documented challenges are from the teacher perspective. However, Whitin and Whitin (2011) noted that there are also factors that inhibit students from having a critical stance, particularly with data from online sources: (a) their feeling that they do not have the power to question data, (b) children tend to blindly trust online sources, and (c) they believe numbers are sacred and unbiased. Staples (2005), in her work with an Advanced Placement (AP) calculus class at a wealthy boarding school, found that while students were affected by data on the distribution of wealth in the U.S., they "had difficulty seeing how their privileged positions in the elite school allowed them to participate in the social reproduction of class in the United States" (in Leonard et al., 2010, p. 266). Brantlinger (2013) noted that many of his students engaged in active or passive resistance, wishing they could just work with numbers instead of what seemed to them as irrelevant social issues, including some high-achieving students who felt the course was not preparing them for college math. Sometimes Brantlinger (2013) agreed with his students that a discussion of social issues distracted from the mathematical content of the lesson. Additionally, when students' experiences did not match with the data, they had a hard time conceptualizing the social reality of the math problems (Brantlinger, 2013). Frankenstein also pointed out that many of her adult students still believed in the American dream, for if they admitted it was a false social construction they would have also been admitting that success was impossible (as discussed in Aslan Tutak et al., 2011). Given this, is it always responsible to encourage a critical stance, if it causes students to lose hope? I personally believe it is still valuable, and that a "pedagogy of discomfort" can encourage student growth (Stylianou-Georgiou et al., 2006).

As Gregson (2013) noted, "findings that merely characterize what counts or does not count as social justice mathematics teaching are less helpful for teachers trying to do this work than findings that reflect a dynamic, practice-oriented vision of the effort" (p. 165). Given the small number of studies on critical mathematics, and the fact that there are only a few texts for practitioners that have examples (such as Gutstein, & Peterson, 2005; Whitin & Whitin, 2001), more work is needed. Brantlinger (2013) outlined an additional practical challenge:

> If U.S. citizens, including many students in high-needs schools and remedial settings, continue to believe that economic competitiveness depends on high achievement, and if economic and educational competitiveness is valued above all else, then there may be little space left for critical pedagogy in mathematics education or in the general curriculum for that matter. (p. 1077)

There is no simple answer to this dilemma, and it is one that all critical educators must face. Yet, as Ms. Myles suggested in Gregson's (2013) study, and Terry (2010) suggested after his work with African-American high school students, it is possible to both teach students to be critical while preparing them for gatekeepers such as passing high school math courses and standardized tests.

Despite the inherent challenges in teaching math for social justice, and the lack of models, there has been proven success in using this methodology, which makes more research valuable. Gutstein (2003) found that over a two-year period, his students' standardized test scores improved one point for every month he taught them. Mitescu, Pedulla, Cannady, Cochran-Smith, and Jong (2011) used a Teaching for Social Justice Observation Scale (TSJOS) of the Reformed Teaching Observation Protocol Plus (RTOP+)" (p. 15) in their observations of 22 elementary school mathematics teachers, and found there was a positive correlation between teachers who scored highly on TSJOS and student scores on post-tests. Besides text scores, most scholars (Brantlinger, 2013 and Bartell, 2013 are exceptions) found that students gained

confidence in their math skills, were more interested in math, and could use math to critically engage with their social worlds.

Summary

Drawing from Gutstein's body of work, the main underlying tenets of critical math are that math should be used to read the world, is not a neutral subject, should be relevant to students' lives, and encourage students to take action for social justice. Most of the studies in this sub-field have been conducted with pre- or in-service teachers, with Franklin (1989) and some of Gustein's (e.g. 2003) work as exceptions that focused on student outcomes. All critical math is conducted with social justice in mind, making it a natural inclusion in this amalgamation of literature. Because of critical math's broad tenets of reading the world, there is an opportunity for including queer pedagogy which can shape how the world is read. Furthermore, this queer inclusion may help move the focus of math instruction from concrete outcomes to more abstract forms of growth that are necessary for social justice learning, such as increased empathy and gaining comfort with social differences. In turn, critical literacy and new literacies can inform critical math and help students with the research that is necessary to conduct mathematical investigations and research.

Table 5

*Mathematical concepts and social justice topics taught through critical math**

Author(s)	Math concepts and skills	Social justice topics
Frankenstein (1989, 2005)	Statistics, mapping	Race, social class, Eurocentrism
Skovsmose (1994)	Creating an algorithm	Child and family benefits
Gutstein (2003)	Data comparison, statistics	Racial discrimination through housing prices
Root (2009)	Various "quantitative literacy" concepts	Varied topics: wealth inequality, voting rights and laws, pensions
Terry (2010)	Statistics	Race; School to prison pipeline
Leonard et al. (2010)	Algebra and displacement, geometry, calculus	Underground railroad, resource allocation, distribution of wealth
Johnson (2011)	Ratios, mapping, averages, estimation	Gutstein's (2006) South Central activity- ration of movie theaters, community centers, and liquor stores in different communities
Whitin & Whitin (2011)	Statistics, use of language in surveys to create the statistical data	Food advertising targeted at children
Lucey & Tanase (2012)	Statistics	Corporate pollution
Stinson et al. (2012)	Algebra, statistics	Racial profiling, minimum wage
Brantlinger (2013)	Statistics, mapping, geometry	Race and recess, housing
Bartell (2013)	Statistics, cost	Costs and spending of prisons compared to schools; minimum wage compared to living wage

Note: This table only includes lessons taught and reported through research studies, not content suggested in conceptual articles

2.5 NEW LITERACIES

The last set of literature considered for this study is new literacies, so termed by The New London Group (1996). This is an umbrella term which includes "21st century literacies, Internet literacies, digital literacies, new media literacies, multiliteracies, information literacy, ICT [internet communication technology] literacies, and computer literacy" (Coiro, Knobel, Lankshear, & Leu, 2008, p. 10). New literacies also include fanfiction and roleplaying communities (Black, & Steinkuelher, 2009; Black, 2013; Thomas, 2013), social media and online forums (boyd, 2014; Davies, 2009), video and sound production (Bruce, 2009) and even video games (Gee, 2007). Though "specific instances of new literacies may come and go quickly…they are all historically significant as parts of a larger picture that is not fleeting" (Lanskshear & Knobel, 2006, p. 64). New literacies are part of the social fabric.

Because of the interaction with society, literacies are currently defined in this field as not only an understanding of text, but also how this understanding "interacts with the social demands of the culture" (Rhodes & Robnalt, 2009, p. 155). As further defined by Lanskshear and Knobel (2006), literacies are "socially recognized ways of generating, communicating and negotiating meaningful content through the medium of encoded texts within contexts of participating in Discourses (or, as members of Discourses)" (p. 72). Here, Gee's (2012) concept of Discourse (rather than discourse) is invoked, which extends beyond verbal and written language to an "identity kit" that includes such elements as "deeds, values, [and] feelings" and allows one "to get recognized as a given kind of person at a specific place and time" (p.152). Because of these social interactions with Discourses, literacies are always connected to power (Wyatt-Smith & Elkins, 2008). To this end, literacy scholars have distinguished between "literacy events" and literacy practices," in that:

> Literacy events are defined as any event involving a written text. Literacy practices… are what can be inferred from observable literacy events as embedded within broader social and cultural norms. Practices… are more abstract, related to matters of codes and conventions, beliefs and attitudes, and legitimation and control. (Lewis & Fabos, 2008, p. 1113)

My study involved literacy practices, and was originally conceived to focus on literacy practices online. Due to the scope of my dissertation study, this literature review will focus on new literacies used by adolescent youth, primarily those online (also called digital literacies). As such, I will first give an overview of different forms of digital literacies and how they are used by both youth, what youth learn by using them, and how this has been incorporated into the classroom and education research. Next, I will discuss how identity is implicated in digital literacies, as this is of interest to my study. Lastly, I will discuss some of the limitations of using digital literacies before discussing the implications for my study.

Online Forms Popular with Adolescent Youth

Adolescents use many forms of digital literacies. This section will provide a brief overview of how adolescents use blogs, fanfiction, memes, and social media as literacy practices. Often, these practices form "affinity spaces," described by Gee (2004) as those online and/or offline interactive spaces comprising people held together either loosely or tightly by means of shared activities, interests, and goals" (as summarized in Lanskshear & Knobel, 2006, p. 213).

Blogs (or weblogs) are a participatory practice (Lanskshear & Knobel, 2006). Bloggers posts are usually multimodal, as they can be a combination of text, image, and video, but what makes them participatory is mainly the comment section. Setting up blogs is simple, as there are many free sites to choose from, such as Blogger or Wordpress, which come with a variety of templates so users can customize the look of their blog. Lankshear and Knobel (2006) described blogs as "hybrid blogs" when the "posts involve a combination of links plus commentary with content that is more like journaling" (p. 153). They further asserted that a blog will last longer if

it has a strong and committed sense of purpose" (p. 155), "has a recognizable and well-informed point of view" (p. 156), "good quality, accessible writing" (p. 157), and is "easy to navigate" (p. 158). One currently popular blog host is Tumblr, which is a home for many queer youth and youth of color (Wargo, 2014). As such, Tumblr has become an online community for these youth; a space to share their experiences and form friendships. Tumblr tends to be image-heavy, with less emphasis on text, and allows users to easily share posts from other users.

Fanfiction is a practice where people write their own imaginative narratives using characters from popular novels, television shows, or movies (Black, 2013). Popular fanfiction topics are Harry Potter, Lord of the Rings, anime (Japanese graphic novels and/or cartoons), and other novels and movies that take place in fantasy worlds. When fanfiction is online, it is collaborative in nature as writers ask for feedback from their peers (Black & Steinkuelher, 2009). As Black noted in her research with children's fanfiction communities, fanfiction writers sometimes include an "author's note," which may include things like the inspiration for the story, background on the characters, or also ask for feedback on spelling and grammar (Black, 2013). Authors may also have trusted "beta" readers, who they will send drafts to and get feedback before publishing online. At other times, the collaboration may come from different writers picking up and continuing a story.

Memes are another popular form of digital practice that many youth participate in by either creating their own memes or including them on their blogs or social media sites. They may take many forms (video, image, text), though the most common memes today combine a still image with text. Lankshear and Knobel (2006) defined memes as:

> Contagious patterns of cultural information that are passed from mind to mind by means of selection, infection and replication. An idea or information pattern is not a meme until someone replicates it by passing it on to someone else, and … the probability of a meme

> being contagious within a group is directly tied to the values, beliefs and practices of that group." (p. 212-213)

Memes are playful by nature, and require the creator not only to understand cultural norms and events, but to critique them. Counter-memes (Lankshear & Knobel, 2006) are created to critique what the creators see as damaging ideas or images.

Social networking sites are popular places for youth to share writing, images, and video with their friends. Communicating online, whether for private use or as part of a class, may allow participants to be more honest about sensitive topics, as well as allowing more thoughtful responses as there is more time to reflect and think about a response than in face-to-face conversation (Bowers-Campbell, 2011). Yet the binary between on and offline is a false one, as "youth's online activities are often intertwined with their off-line social worlds" (Black & Steinkuelher, 2009, p. 272). This intermeshed lifestyle allows them to "move seamlessly between 'online' and 'offline' spaces, and their digital literacies reveal hybridity in their multispatial navigations" (Vasudevan, DeJanes, & Schmier, 2010, p. 6). For many users of social media, but perhaps particularly for youth, "online social networking has become embedded in [their] offline lives" (Davies, 2009, p. 29). boyd (2014) called this phenomenon "networked publics" meaning "publics that are restructured by networked technologies [that are both] (1) the space constructed through networked technologies and (2) the imagined community that emerges as a result of the intersection of people, technology, and practice" (p. 4). Continuing to conduct research exploring the differences between online and offline social networks is perhaps becoming less useful as the lines are blurring.

Youth's Inherent Digital Literacy Practices

One of the skills prominently featured in digital and multimodal literacies is "'remixing'—where a range of original materials are copied, cut, spliced, edited, reworded, and

mixed into a new creation" (Lanskshear & Knobel, 2006, p. 76). This can include student DJs creating new sounds on turntables (Gustavson, 2013), multimodal papers published online (Erstand, 2013), photography projects (Hagood, Skinner, Venters, & Yelm, 2013) and also fanfiction and memes (Black, 2013; Lanskshear & Knobel, 2006). As Lankshear and Knobel stated,

> Remix is the general condition of cultures: no remix, no culture. We remix language every time we draw on it, and we remix meanings every time we take an idea or an artifact or a word and integrate it into what we are saying and going at the time. (p. 107)

This sentiment is echoed not only by other literacy scholars (such as Erstad, 2013; Gustavson, 2013), but also in anthropology, as Tom Boellstorff (2003) wrote in *Dubbing culture*, "to 'dub' a discourse is neither to parrot it verbatim nor to compose an entirely new script. It is to hold together cultural logics without resolving them into a unitary whole" (p. 226). These ideas of dubbing and remixing acknowledge the agency of the subject, as well as the constant flux of the process. Several researchers investigating youth digital literacy practices have written about the power students find through remixing (Erstad, 2013; Gustavson, 2013). Wargo (2014) found that the high school students he worked with used Tumblr's reblogging feature (where users can find posts they like on other Tumblrs, and then repost them on their own Tumblr site) as a form of remix and a way to "resist hegemony and dominant cultural logics" (presentation handout).

Using social media sites and participating in online communities allows youth to develop valuable literacy skills. As Davies (2009) found with a group playing together on Flickr (a site for sharing photographs), participation in taking funny pictures together required "teamwork; planning and preparation skills; understanding narrative structure; photographic techniques…; and linguist expertise to design titles, captions and tags[7] to help tell the stories illustrated in the

[7] Labels used similarly to those in library catalogues: when clicked they will show the user other photographs with the same label

images" (p. 28). Similar skills were found by Thomas (2013), in her study of youth participation in *"Gathering of the Elves* (*GOTE*)," an online Tolkien-based role-playing community. Youth participants wrote narratives from different characters' perspectives and posted them on the site. Youth also monitored the site by serving as "moderators," where they were in charge of making sure the published work met the communities' standards for content and language. New participants in *GOTE* would use their observation skills to learn the rules, but if someone wrote part of a story out of character, it was removed by a moderator and the participant was advised how to properly play. As such, "children [were] learning that to be literate is to have power,…[as] the role-playing requires each person to carefully read the contributions of others and use the cues provided by them to insert their own character's next actions meaningfully into the text" (Thomas, 2013, p. 277).

Youth also alter their literacy practices depending on their audience. Thomas (2013) found in her interviews that the youth sometimes worked for hours on their writing, and one participant stated he purposely studied how to use more sophisticated vocabulary to impress his audience. This echoes a study by Lewis and Fabos (2008) on instant messaging (IM), a form of online communication that was popular in the early 2000s. The researchers found that "participants used linguistic features to manipulate the written tone, voice, word choice, subject matter, and structure of messages" (p. 1126) as well as being "spelling conscious with those individuals they were trying to impress" (p. 1128). As Nixon, Atkinson, and Beavis (2006) found, the research on youth use of digital literacies illustrates that "students' use of ICT [information and communication technologies] outside school, as well as being self-directed and recreational, are often expressly about networks geared towards the exchange of skills and knowledge for mutually beneficial ends" (p. 133). This type of intense peer review, careful

consideration of language, and enthusiastic engagement in literacy is what English teachers dream of, but rarely find in a secondary classroom.

Digitized Literacy Practices in the Classroom and Education Research

Many researchers have compared the skills used in print literacy as compared to digital literacies (see Rhodes & Robnalt, 2009, for a summary). Generally, the print-based strategies of "(1) activating prior knowledge; (2) determining important ideas; (3) synthesizing; and (4) drawing inferences" (Schmar-Dobler, 2003, as summarized in Rhodes & Robnalt, 2009, p. 161) are still used online. However, along with activating prior knowledge of the topic, they will also activate prior knowledge of using the technology (Rhodes & Robnalt, 2009). Additionally, students will need more support with determining important ideas and deciding what sources are reliable (Rhodes & Robnalt, 2009). Reading online is also complicated by hypertexts, meaning readers can follow links to other sources from the original text, and so reading online is no longer a linear task (Rhodes & Robnalt, 2009; Stylianou-Georgiou et al., 2006). This allows the text to be "more learner-centered" (Stylianou-Georgiou et al., 2006, p. 24) as there is no beginning or end. Furthermore, readers:

> Must simultaneously navigate through multiple layers to construct their own unique text and monitor their own understanding of the reading. There can be many paths to create a text, where each reading may result in different information or the reader may come to a different understanding or conclusion. (Rhodes & Robnalt, 2009, p. 162)

Educators must then give students more freedom when reading online to explore these multiple avenues.

To assist students in navigating online texts and social networks, Davies (2009) suggested that educators can "provide new challenges and direction, making learning less random, helping everyone to access digital texts, and to become self-aware, critical readers and producers of new literacies" (p. 33). Davies (2009) also pointed out that "while playfulness

engenders learning…play that occurs in some informal online activities may be narrowly focused, unchallenging and repetitive" (p. 33). This is where classroom facilitation of online activities can broaden student knowledge, both of topics of interest and of how to use the Internet more strategically. Some teachers have also found that students are more likely to make revisions when their writing is on the computer (Karchmer, 2008). Bleicher (2008) labels "the teaching strategy of employing the Internet to achieve student-learning outcomes as Internet pedagogy" (p. 1093), and this label can be applied to as several digital literacies classroom practices employed by other educators and researchers.

Teachers are increasingly incorporating blogs (Davies & Merchant, 2009; Vasudevan et al., 2010), private social networks (Casey, 2013), and computer-mediated communication (CMC) (Beach & Lundell, 1998) into the classroom. Blogs and Nings (a popular platform for creating private social networks) allow students to have an audience, even if it is limited to the classroom, which Vasudevan and colleagues (2010) found can be a motivating factor. These and other online tools can also assist in facilitating collaboration, as well as "support reflective language teaching and learning" (Stylianou-Georgiou et al., 2006, p. 6). Vasudevan found that "blogs provided a way to not only get to know my students better as writers and media-savvy young people but also enabled me to be a better advisor—to follow up digitally and in person, sharing in their successes and struggles and supporting students as they developed into independent young people" (in Vasudevan et al., 2010, p. 16). Casey (2013) found that "integrating online media enhances literacy in the face-to-face classroom" (p. 62), particularly when that media is similar to what the students use in their personal lives. Casey's students were able to talk to her and each other, both in the classroom and online, making communication easier.

In Beach and Lundells' (1998) study, students used CMC during class, and they found that it enhanced the discussions in several ways: (a) students who were normally quiet were more likely to participate, (b) they felt safer participating online, and (c) "given this sense of safety, they were more likely to formulate provocative, outrageous positions than in FTF [face-to-face] conversations, which, in turn, were more likely to evoke reactions and disagreements" (p. 97). Along with these improvements to class discussion, students were using inferring skills as they had to figure out the main points from strings of messages, and they also had more time to reflect on their classmates' comments, which allowed them to compose more thoughtful responses, as well as being more likely (as noted previously) to write responses that countered their classmates' opinions. The researchers suggested that to use CMC successfully, teachers will need to establish goals and guidelines depending if they want to use it primarily for building relationships, holding discussions, or facilitating collaboration (Beach & Lundell, 1998). The same is undoubtedly true for other digital tools in the classroom.

Another major component of internet pedagogy is the use of metadiscussion and metaknowledge (Lankshear & Knobel, 2006; Lewis & del Valle, 2009; Rhodes & Robnalt, 2009; Unsworth, 2008; Wyatt-Smith & Elkins, 2008). As described by Unsworth (2008):

> Teachers and students need … metalanguage for talking about language, images, sound, and so forth, and for their meaning-making interactions…Metalanguage gives students and teachers a means of comparing texts, of determining what semiotic choices were made in constructing particular meanings, what alternatives might have been chosen, and the effects of particular choices rather than others. (p. 378)

Rhodes and Robnalt (2009) found in their review of digital literacies studies that "multiple studies suggest that when incorporating digital literacies into the classroom, they should engage in a 'meta-discussion' on how students use digital literacies outside of school (p. \65). Lewis and del Valle (2009), in their review of literacy research and identity, found that "students [were] engaging in metadiscursive talk about the ways in which they have been positioned within their

various social worlds and how this impacts their ways of reading and interpreting the texts" (p. 317), and found that metadiscursive talk is discussed often in work on digital literacy. This type of discussion would be valuable for any educator, as it can help a teacher identify both existing skill sets and gaps. Wyatt-Smith and Elkins (2008) found that by incorporating "metacognitive aids like concept maps, decision-making matrixes, or retrieval charts… students can be encouraged to pause and reflect on the information or issue … thereby assisting their internal negotiation of meaning and/or personal representation of meaning" (p. 922). Lankshear and Knobel (2006) pointed out that youth need "meta-knowledge about how to avoid being scammed" (p. 240) online. Since discussing internet safety is common among teachers who use internet pedagogy (Davies & Merchant, 2009), this is likely a part of these discussions.

Identity Play Online

As digital literacies are used by adolescents by their own choosing, it follows that identity is implicated in how they use their literacies. Sometimes youth may use online communication to play with identities for purposes such as role-playing (Thomas, 2013), to resist stereotypes and norms (boyd, 2014; Black & Steinkuelher, 2009; Lewis & del Valle, 2009), to impress a friend (Beach & Lundell, 2008; Thomas, 2013) or to trick them (Beach & Lundell, 2008). Identity is performative, but perhaps it can be easier to perform multiple identities online, where you can simply abandon identities if you get tired of them and create new ones. This identity play also has implications for learning, as the Internet

> offers an environment in which young people create identities that allow them to enter the *textual worlds* of groups they want to join. In the process … participants demonstrate numerous literacy skills, including adjusting the tone and content of their writing to address a variety of audiences and purposes. (Lewis & del Valle, 2009, p. 314, emphasis added)

Creating an online identity can be an especially positive experience for who do not shine in school or other settings offline. For example, Black (2013; Black & Steinkuelher, 2009)

found that English Language Learners (ELLs) were supported in their writing in online fanfiction communities. Here, if the story took place outside the U.S., immigrants can be seen as cultural knowledge holders and language consultants (such as Japanese-speaking youth writing anime fanfiction). One of Black's (2013) participants also fluctuated in how much of her race and nationality she would reveal, sometimes self-identifying as Chinese, and other times as Asian. She also used the author's note to ask for gentle feedback by saying "no flames" and sometimes identifying herself as a non-native speaker of English (Black, 2013). Generally, the community members responded positively by giving both encouragement and feedback on language and grammar. This type of feedback was also found in the *Gathering of the Elves* community researched by Thomas (2013). She found that one youth writer even wrote a poem asking if he should remain in his identity as moderator when other participants expressed disagreement with his strict rules. Additionally, fanfiction "writers often fuse their identities with those of the characters in the stories to create autobiographical … characters, thus providing a means of expressing issues and concerns from their daily lives" (Black & Steinkuelher, 2009, p. 276).

Gender play is also common online. In fanfiction communities, female youth will write their female characters as the heroes of the story, purposely rejecting gender stereotypes (Black & Steinkuelher, 2009). Thomas (2013) found that youth would often write from a gendered perspective different from their personal gender identity, but that had less to do with personal identity play and more to do with fitting the role-play. However, this role-playing online has more depth than may occur offline, as it is safer in the online space to explore these possibilities. Marshall (2008) stated that while gender can be vague online, this actually may "reinforce power, and fits in with the idea that social problems can be solved by getting the oppressed to

shut up, as it is the excluded who apparently make friction by complaining" (p. 499). He further noted that while some online users may claim that race and gender are irrelevant, they tend to be worried that the people they talk with may not be representing themselves truthfully. For example, women may actually men or avoid using gendered markers to avoid harassment but when men engage in this behavior, it is seen as more troubling (Marshall, 2008). As Marshall stated, though technology is generally touted in the West as liberatory, it does not exist outside of society's norms, including those of gender.

As such, all identity play and exploration is not positive. Navigating fluctuating identities online, and their interactions offline, can be difficult for youth. As boyd (2014) noted, teens sometimes intend for different audiences to read their online posts, even if these are public, and become frustrated when they get a comment from an unintended participant. This usually happens when they are juggling different identities and peer groups on social networks. As Marshall (2008) noted, "online communication, in itself, does not free a person from the expectations of a socially conditioned audience and their conventions, especially when that audience interacts with them offline" (p. 514). Some youth may use online communication to maintain their own expectations of relationships, and "pose" as others to check on friends or significant others (Lewis & Fabos, 2008). Participants in online chats may adopt the word choice, tone, and punctuation of another in an attempt to perform their identity and thus find out gossip. As with more positively motivated identity play, these negative ones also involve sophisticated literacy practices "that relate to changing discursive and social spaces" (Lewis & Fabos, 2008, p. 1147).

Limitations

The use of new literacies in the classroom faces many limitations. One is the issue of trust (Lanskshear & Knobel, 2006). Teachers are hesitant to give students free use of computers, the Internet, and other digital technologies in case students take advantage of this freedom and get off task. This corresponds with perhaps the biggest concern by school staff and parents: online safety (Davies & Merchant, 2009). Teens are unlikely to remember that along with the people they are intentionally talking to online, or the imagined audience they are posting and writing to, there are others watching (boyd, 2014). As Davies and Merchant (2009) asserted, online safety is precisely why teachers should use Internet pedagogy, so that they can teach students how to protect themselves. Additionally, collaborative online work "may also silence work which is not conventional, [or] from the right people (however defined)" by the classroom or broader online community (Marshall, 2008, pp. 514-515). And unsurprisingly, a school or district-wide focus on testing can also decrease the amount of time teachers can use new literacies (Bruce, 2009). Equity is also a big issue, as not all students have access to computers in or outside of school, and further may not know how to navigate the technology successfully (Bruce, 2009; Davies, 2009; Rhodes & Robnalt, 2009). This also extends to teachers, as for some it will increase their work load if they have to learn how to use the technology themselves before developing lessons around it (Karchmer, 2008).

Bruce (2009), in his work with media literacy, found that while media incorporation can increase engagement, students may struggle with talking about it in academic language. Interestingly, though much research has touted the use of students' out-of-school literacies in the classroom, Bruce (2009) also found that students could be resistant, in that "the more vested in media texts the students felt, the less receptive they were to exposing them to academic rigor. If students did not feel a threat to their individual media, then they tended to respond with a high

level of interest and enthusiasm" (p. 301). This suggests that sometimes teachers may have to negotiate, and convince students that using a form of media in school will not take away from their enjoyment. Another form of resistance noted by Lewis and del Valle (2009) is that while digital literacy does allow for participation, this participation is still controlled, and youth are usually aware of these contradictions.

Lastly, students will need support is judging online sources. As such, "Internet pedagogy might be viewed as a risky venture for achieving student learning outcomes unless teachers conduct regular checks to ascertain the accuracy of student learning" (Bleicher, 2008, p. 1104). In Karchmer's (2008) study with teachers' uses of the Internet in their literacy instruction, she found that the secondary school teachers focused on "the precautions they took to ensure safe Internet use and the skills necessary to evaluate information found on the Internet" (p. 1295). Though these teachers obtained signed permission forms from parents before incorporating the Internet into their teaching, they still worried students would find inappropriate materials if searching on their own. To ameliorate these concerns, the teachers "approached teaching and reinforcing the evaluation of Internet information in two ways: (a) They discussed with their students the importance of evaluating information and (b) they developed criteria so their students could evaluate information on their own" (Karchmer, 2008, p. 1265).

Summary

New literacies scholars believe that literacy is socially constructed and that interpretation depends heavily on a person's Discourse communities. Because of these social connections literacies are always linked to power (Wyatt-Smith & Elkins, 2008). New literacies also refers to the plethora of multi-media texts available: online reading, blogs, fan fiction, social media, etc. Creating texts online can allow students to participate in a social community, hold power over

texts, and explore new forms of literacy. It can also create problems for the classroom, however, when teachers and school systems worry about students online safety and limit their ability to interact with a broader community. Students can also have a difficult time discerning an online source's legitimacy. However, many scholars advocate for studying new literacies and the literacy communities inherent to students and advocate that the benefits outweigh the safety concerns. New literacies has the potential for inclusion in social justice pedagogies as students may need to examine a broad range of texts to conduct research. They will also need an awareness of different Discourse communities when reading about social justice topics, which also uses their critical literacy skills. Because new literacies can blur the lines between what is considered a school text, as well as outside and inside school communities as students work online, queer pedagogy can be included and these lines and boundaries can be given careful consideration. Lastly, because students working on critical math projects will need to conduct online research, new literacies meshes with this body of literature, as students will learn how to navigate online sources and differentiate between legitimate sources and propaganda.

2.6 LITERATURE REVIEW SYNTHESIS FOR *MATH FOR A CAUSE*

As I hope is evident from the large amount of literature consulted for this study, social justice teaching is complicated and messy. There is no perfect way to engage in social justice with students. Undertaking this work means considering a broad sweep of perspectives and pedagogical theories, and patching them together to fit a particular context. The reason I used these theoretical frameworks together, other than the complexity of the course design, was their shared commitments to critical consciousness, dialogue, reflection, and social action. Though all of these theories may approach these tenets from different points of view or with different priorities, their underlying motivations and structures are similar. Each framework is also a mindset and a way of thinking about pedagogy, rather than a set of prescribed techniques, which makes using them in combination easier. When one practices critical literacy, there is no handbook, instead a teacher uses common elements to create their own lessons. The same is true of the other frameworks used in this study, which will allowed us to try out our own techniques with our students.

Queer Pedagogy in Relation to other Frameworks

Queer pedagogy stands out, as rather than merely asking critical questions to have multiple perspectives in the classroom, queering pedagogy involves an attempt to disrupt the structures on which those perspectives stand. While the other critical pedagogies may teeter on the edge of acceptable teaching practices as judged by education traditionalists, queer pedagogy gleefully jumps over the edge, not seeing it as an edge at all. As such, it is the most difficult to practice in real classrooms that have physical, intellectual, and emotional edges and may cause the most contention. Queer*ing* pedagogy is a verb instead of a noun, and implies action at the forefront. While the other pedagogies assume the action will come through learning (such as

learning to critique texts for the power relationships they imply) queer pedagogy *is* the action and the movement. Instead of focusing solely on the learning outcomes and student products, queer pedagogy may give equal focus to our processes of teaching, or on our conceptions of learning and teaching. Though, as previously stated, the other pedagogies consulted here are described as mindsets about teaching approaches rather than prescribed techniques, queer pedagogy takes this further and strives to actively engage with all parts of teaching and learning. This difference makes queer pedagogy messy and a cause for second guessing every move, which will be seen throughout the analysis chapters.

Queer pedagogy has a lot in common with the ideas of social justice educators. Both theories emphasize dialogue (both student-student and student- teacher), questioning oppressive structures and including voices that are typically excluded (Kumashiro, 2001, 2009). Social justice pedagogy has a focus on social action, and this may not necessarily be a concern of queer pedagogy studies. Queer pedagogy also has commonalities with critical literacy. Critical literacy focuses on print and other media whereas queer pedagogy may examine systems through by behaviors and emotions as well as traditional texts. Additionally, queer pedagogy is focused on dismantling heteronormativity. This construct has been considered by critical literacy researches, such as Jacobi and Becker (2013), but it is not a primary consideration.

There are some critical math scholars calling for practices that relate to queer pedagogy, such as described by Hand (2012) when teachers blurred the lines between what is and is not considered mathematics. Gutstein's (2003) work that involved students in the co-creation of the classroom environment is also queer, as it blurred boundaries between teacher and student and shifted the authority in the classroom.

This study continued in a tradition of critical math literacy, which Terry (2010) defined as combining critical literacies, or the "skills, competencies, and understandings that allow for the critique of and successful intervention in issues of social injustice" with mathematics. While Whitin and Whitin (2011) offered ideas of combining critical literacy and math, their examples are often more focused on critical thinking than creating social action. In *Math for a Cause,* we attempted to add a queer lens to our critical literacy and mathematics in order to allow for a deeper questioning of social issues, which led to a questioning of mathematics and learning as well.

CHAPTER 3: METHODS

In this chapter, I will detail the research methods and describe the location, participants, data collection, data analysis, and reporting. My co-researcher and I used post-critical ethnography (Noblit, Flores, & Murillo, 2004) and Participatory Action Research (PAR) (Kemmis & McTaggart, 2005) methods to explore our multiple theoretical interests: social justice pedagogy, queer pedagogy, critical literacies, and critical math. I will also examine the ethical considerations necessary for this work. To begin, I will discuss my research questions. Then I will outline the methodological frameworks and discuss how these relate to queer methods. The chapter ends with an addendum detailing the differences between the planned methods and what actually happened during the study.

Research Questions

The research questions drew from the literature on social justice, queer pedagogy, critical literacy, and critical math. Overall, I observed how queering critical literacy and numeracy for social justice works in a middle school classroom. More specifically, I hoped to answer the following questions.

Primary question:

1. How does queering math for social justice promote a social justice mindset and action in students, as seen through these criterion: (a) having a critical consciousness, (b) taking action to give people from all social groups equal access to resource and opportunities, (c) acting with love and compassion, (d) providing healing and hope for all people, and (e) participating in a socially engaged spirituality [the Quaker way] (Rendón, 2009)?

This definition of social justice was chosen because The Anchor School was founded on Quaker values. This effected the culture of the school, and thus the way our students related to the world and to social justice, as the latter is a part of Quaker values. Though not all, and perhaps even

few, of the students at The Anchor School were Quaker they were educated with the values of listening, stillness, and peace. This was evident in the briefest interaction with students from The Anchor School, and so must be considered in any research conducted at the site.

Secondary questions:

2. Is there evidence of queering (both in the curriculum and in student's work and conversations), as seen by: questioning norms, limits, ignorance, and reading practices, (Britzman, 1995a) and the queering of everyday moments (DePalma, 2010).
3. Are students performing acts of critical literacy, as seen through these practices: coding, text-meaning, pragmatic, and critical? (Freebody & Luke, 1990)
4. Are students using the above practices in critical math? How are these practices enabling students to: use mathematics to read the world, use mathematics as a tool to analyze social issues; look for relationships between the social issues (Gutstein, 2003)?

Methodological Frameworks

Ethnographic Methods

Ethnography is generally defined as qualitative research that takes place in 'the field' for an extended period of time. Goodall (2000) stated that the processes of ethnography include "living, studying, reflecting, and storying" (p. 11), meaning that the ethnography does not end with data collection, but extends into analysis and reporting when the ethnographer must decide how best to represent the stories encountered in the field. Ethnographers seek to use "thick description" (Geertz, 1973) which Coffey and Atkinson (1996) state can mean using "multiple analytic strategies," such as combing data not only for themes, but also examining "their semantic and metaphorical content" (p. 16). The data collected in an ethnography come from fieldwork, and include field notes on observations, interview recordings and transcripts, and written or narrated descriptions of events the ethnographer participated in. The concept of the 'the field' is an academic one, and for most researchers is defined by physical boundaries as well as university requirements, and typically requires a researcher to go away to a distant place (Coffey & Atkinson, 1996). In this study, the field is not so distant as it is in a local school,

though it was sometimes extended through online participation.

Ethnography has taken many turns since its colonialist beginnings, and I currently am using a post-critical ethnographic frame. Post-critical ethnography sees ethnography as varied, so that "it is less about unity and more about difference" (Noblit, Flores, & Murillo, 2004, p. 2). Post-critical ethnographers also find the binary of theory and method a false one (Noblit, Flores, & Murillo, 2004). Applying a post-critical lens also means rejecting a claim to objective knowledge in "the interrogation of the power and politics of the critic himself/herself as well as in the social science studied" (Noblit, Flores, & Murillo, 2004, p. 19). Similar to queer methods (discussed in a later subsection) and other post-structural ideologies, there is no one way of conducting a post-critical ethnography, rather it is a way of thinking through ethnographic practices. Furthermore, post-critical ethnographers believe that "methods are ideas and theories in themselves," (Noblit, Flores, & Murillo, 2004, p. 3), thus rejecting the method/theory binary. As I entered this study with a lens shaped by several critical theories, I also see method and theory as irreversibly intertwined. Hytten (2004) emphasized that post-critical ethnographies in education have a fluid process, with constant "reflection and critique" (p. 102) between researchers and their collaborating teachers, so that "research subjects are not 'acted on' but instead are seen as knowledge producers whose voices are pivotal" (p. 102). This continuous give and take between researcher and teacher is something Bryan and I planned to strive for in our work.

Hytten (2004), in her critique of post-critical ethnography, wrote that though transformational change is the goal of such work, there is rarely evidence that the research and researcher have contributed to a transformation. As such, researchers engaged in post-critical ethnographic work must always be willing to examine themselves, as she stated that "many

critical researchers substitute one form of hegemony for another" (p. 96). She suggested that engaging in frequent self-reflection is a way to combat this tendency. Researchers should question if in their quest to empower their subjects they are actually taking over. Part of self-reflection means that researchers should "give up the implicit assumption that they know how the world works and power operates, and the researched don't" (Hytten, 2004, p. 96). Hytten (2004) suggested five criteria for post-critical ethnography: (a) collaboration, (b) dialogue: "findings need to be shared and negotiated," (c) findings should be accessible to subjects, (d) "macro understandings" from the work should not be rigidly defined, but should keep the flexibility inherent to the method, and (e) it should be pedagogical in a Freirean sensibility (p. 104). She does not specifically mention reflexivity in her five criteria despite her previous discussion of the issue, though one can safely assume she intends it to be a part of all of these criteria.

This study aimed to adhere to Hytten's (2004) proposed criteria. In line with post-critical sensibilities, I believe that ethnography should be collaborative and reflexive (Lawless, 1992), allowing the ethnographer to be a "vulnerable observer" (Behar, 1996). This study was collaborative by design, as I worked with another researcher and a classroom teacher, so the study was also dialogic. Educational ethnography has evolved since Wolcott's (1973) work with an elementary school principal, in which Wolcott shadowed the principal and did not often interact directly with students. Here, we were not just shadowing the teacher and students, but were directly interacting with them in each class. I looked forward to working with the students and learning alongside them. As someone who is afraid of math, I was excited to see what I learned from this experience, and was willing to be changed by it. As one of my favorite queer theorists wrote, "we are undone by each other" (Butler, 2004, p. 19), and I was more than willing to become undone through this experience. Thus, this project was pedagogical for all involved,

including myself.

Participatory Action Research

Because of these priorities, and because the collaborating teacher wanted Bryan and I to be more than observers and be involved in the process as a whole, this study also used Participatory Action Research (PAR) elements. PAR is defined by Kemmis and McTaggart (2005) as "a social process of collaborative learning realized by groups of people who join together in changing the practices through which they interact in a shared social world" (p. 63). They further clarified that PAR is about "*actual* practices and not *abstract* practices" (p. 564). PAR is thus rooted in shared lived experience, and requires researchers to engage in a continuous cycle of 1) "*planning* a change" 2) *"acting* and *observing* the process and consequences of this change," and 3) "*reflecting* on these processes and consequences" (p. 563). In the case of this particular study, the change is enacted in the course design itself by integrating social justice, and we (myself, Bryan, and Morgan) constantly reflected and assessed how this was working for the students. PAR practitioners seek to describe lived experiences and question "how by collaboratively changing the ways in which they participate with others in these practices, they can change the *practices* themselves, their *understandings* of these practices, and the *situations* in which they live and work" (p. 565).

A PAR framework for our post-critical ethnography allowed us to focus on this planning and reflecting cycle, as well as maintain an intense focus on the processes that result from these plans, reflections, and subsequent enactments. Because post-critical ethnography must be flexible, using PAR in conjunction with it allowed us to play with the relationships between social justice, queer pedagogy, critical math and critical literacy, and to reflect and rework our approaches as the course progressed. Another reason PAR and post-critical ethnography work

well together in this study is that PAR *"aims to transform both theory and practice*" (Kemmis & McTaggart, 2005, p. 568, emphasis in the original), and post-critical ethnography seeks to create change. Also, since post-critical ethnography sees theory and method as bounded, this corresponds with the idea Kemmis and McTaggart (2005) described of transforming both of these elements as they work together. While we had ideas of what our theories would look like in practice, we were also looking for examples that did not match the existing theoretical maps. Referring again to Butler (2004), I was willing not only to be undone myself, but for my theoretical models to be undone as well.

Queer Methods

Stemming from queer theory, which has a distaste for all socially constructed binaries, it should be no surprise that queer methodologies explore the artificial binaries of theory/method (Boellstorff, 2007) and data /theory (Weiss, 2011) Ultimately, queer methodologies view all three elements as constitutive of each other with no clear boundary between them. Queer theory can affect qualitative methods in a variety of ways, including how the research design is constructed, how the field is conceptualized, and how data is collected and analyzed. Using queer theory can allow methodologists to accept the slippages and instability that are inherent for all qualitative research. Queered methods are post-structural (Britzman, 1995b; Plummer, 2005; Talburt, 1999), in that they attempt to disrupt social constructions. Queer methods do not necessarily include radically different ways of data collection, but they do mean a greater attention to the way data, the field, and research projects are constructed by both the researcher(s) and institutional norms. Because this study incorporated queer pedagogy, which encourages a disruption of curricular norms, it seemed natural to include queer methods to ensure that we are also questioning and reflecting on our research norms.

Location and Participants

They study was conducted in the middle school at The Anchor School, a private K-12 Quaker school in central North Carolina. Originally we thought the study would also incorporate students' interactions online, though this was not the case. While I have personal contacts at the school, it was not chosen for convenience, but instead because I thought equity and social justice were values embraced by the school community and included in curriculum. Some examples that led me to this belief are: the annual event in honor of Dr. Martin Luther King Jr.; bringing in guest speakers who are humanitarians and dedicated to diversity; participating in diversity events in the region; and inclusion of service learning in the middle and high school curriculum. This belief also came from their mission statement:

> [The Anchor School] is a vibrant and inclusive learning community empowering students to think critically, creatively, and independently. We foster active exploration and quiet reflection, individual endeavor and collaborative engagement. Inspired by Quaker values -- pursuit of truth, respect for all, peaceful resolution of conflict, simplicity, the call to service -- we teach our children that it is possible to change the world. (citation omitted for anonymity)

At a different school, it is likely that Bryan and I would have needed to conduct a longer study, in which we would begin with diversity training for students and staff. As we felt this was not necessary at The Anchor School, we began instead with our equity integration directly in the classroom. We conceived of this study as a pilot for future work.

We planned to work with 7th and 8th grade students, though when the course enrollment began we had students in 5th, 6th, and 7th grade. All participants enrolled in *Math for a Cause*, an elective class that Bryan and I developed in collaboration with Morgan, a math teacher at the middle school. The class began on September 4, 2014 and concluded on Nov. 11, 2014. We hoped to have (a) students interested in social justice, (b) students who self-selected the course, (d) students willing to participate in the study, and (d) collaboration among researchers and Morgan. Class enrollment was capped at 15 students, 12 students ultimately enrolled, and

enrollment in the study was open to all. 10 out of the 12 students participated in the study. Since this was an elective course, the class population was self-selected by students who were interested in both math and social justice, and/or enjoyed taking classes with Morgan. There was a possibility that some students may have been pressured into taking this class by their parents, but there are approximately 35 electives offered each trimester, and students are required to take three. Since there were a wide variety of options, we felt it was highly unlikely that there would be many students in the class who did not wish to be there.

To protect the privacy of the students, we used student-chosen pseudonyms, both when discussing interview and focus group data in reporting and when students interacted online. In collaboration with the students and Morgan, we had planned to create online pseudonyms for students that would not reveal any identifying information about themselves or the schools. Students were to be monitored by Morgan, Bryan, and I to ensure that they were not using any personal accounts online for course assignments. A key was kept with student names and associated pseudonym(s) on a secure computer, and this key was destroyed after all data was transcribed and/or blinded. The use of pseudonyms was also a study limitation, as though we had planned for students to act in the online 'real' world, they were not allowed to have complete control of their own voice.

In line with post-critical ethnography and queer methodology, Morgan was not strictly a participant or a collaborator (Detamore, 2010; Hermann-Wilmarth & Bills, 2010). She was a collaborator in that Bryan and I planned the course curriculum with her. Additionally, she will have the opportunity to co-author future publications with us. However, due to IRB regulations, she did not assist in conducting the focus groups with us or the pre- and post- interviews, and was not allowed access to this data directly. This limited our ability to use truly collaborative

methods. Our data collection included notes on our interactions with Morgan, and her interactions with students, which highlighted the blurred lines between researcher and research subjects.

Course Planning and Data Collection

Focus Groups

Data collection began with a focus group of four students to determine what social justice issues students are interested in, which will in turn help inform the course. We chose this method because focus groups can help engage "participants' synergy that often leads to the unearthing of information that is seldom easy to reach in individual memory" (Kamberelis & Dimitriadis, 2005, p. 903) as well as "allow for the proliferation of multiple meanings and perspectives as well as for interactions between and among them" (Kamberelis & Dimitriadis, 2005, p. 904). Bryan and I visited the school in the morning during their announcement time, and we and Morgan explained that we needed their help to plan our course on math and social justice. We were greatly helped by Morgan, who started the conversation by asking students to raise their hand if they knew what social justice is, and then again if it is an issue important to them. After we read our IRB-approved script, some of the staff asked questions that helped clarify the process for students, for example asking us to explain what a focus group is. The other teachers and the head teacher (similar to a principal) were very helpful and enthusiastic about the project, which gave us great encouragement.

We conducted a thirty minute focus group a few days after the announcement, with four students. Two were in 5th grade, one in 7th, and one in 8th. We audio recorded the meeting and took field notes, noting things like facial expressions and other behavioral indicators of excitement, discomfort, etc. Afterwards, I transcribed the recording, and after blinding the

transcript we shared it with Morgan. I coded the transcript using open coding, looking particularly for descriptions or examples of social justice, math, and possibilities for queer moments. We found that the students were all interested in issues around homosexuality, specifically marriage equality, as that has been in the news a lot since Amendment One passed by popular vote in North Carolina on May 8, 2012[8]. Students also brought up issues of environmental justice, affirmative action, and general racial inequality. Bryan asked if they saw a connection between environmental justice and the other issues of race or homosexuality they brought up, but they were not able to make a more complex connection. However, overall they discussed social justice in highly sophisticated ways and surprised and impressed us with their thoughts. We also saw evidence of the Quaker sensibility taught by the school, as the students did not think it was right to try to change people's beliefs outright about social justice issues, but instead thought it was best to "show them another angle" (focus group participant, May 2, 2014) or point of view. This statement aligns with the Quakers' peaceful, reflective values that prefer listening and silence above shouting for attention. See Appendix A for the IRB approved focus group guide.

Course Planning

In May and August of 2014 Bryan and I met with Morgan to plan the course. We presented to Morgan the social justice issues brought up by the focus-group students as high-interest, and planed the math elective course around these issues, using our research questions for additional guidance. Because queer issues were brought up in our focus group, and the school has a large and active gay-straight alliance (GSA), these were chosen as one focus. In August, a young man named Michael Brown was shot and killed by a police officer in Ferguson, M.O.

[8] Section six of N.C. Amendment One stated "Marriage between one man and one woman is the only domestic legal union that shall be valid or recognized in this State*"* (N.C. S. 514, 2011).

(Bosman & Fitzsimmons, 2014) and we all decided we should start our course on this topic, as it was present in the public discourse. From here, we brainstormed ways math can be incorporated into a discussion of these issues. For the math piece Bryan initially had more involvement as that is his specialty. The course design remained flexible, as we wanted the math content to generate from the issues selected and the online articles found by students, teacher, and researchers. I saw my part as suggesting how queer pedagogy and critical literacy could be included, particularly in the reading of online articles. I planned to incorporate questions such as: What norms are included in discussion on social justice issues? From what viewpoint are we reading articles about this topic? Why are numbers and statistics considered "truths"? Can, and should, we use this perception to our advantage in promoting social justice? What groups are mentioned in an article, and what groups are left out? Who is the intended audience? How does a social justice mindset change the way you read an article? What are the different perspectives amongst online commenters, both student and non-student?

I also planned to use Freebody and Luke's (1990) framework of critical literacy practices for both the literacy and critical math components of the course: coding, text-meaning, pragmatic, and critical (Freebody & Luke, 1990). My thought was to use this framework to scaffold student learning, as well as teach them both the practical math skills necessary and how to critique and question both the math and the texts. One of our goals was to fulfill Gutstein's (2003) criteria for critical math in practice: using mathematics to read the world and as a tool to analyze social issues, as well as looking for relationships between the social issues.

Data Collection during Course

"Math for a Cause" was offered to 5th-7th graders during the fall 2014 trimester at The Anchor School, meeting twice per week on Tuesdays and Thursdays. Bryan attended one class

per week, and I attended both meetings (with one exception). All students were given a pre-survey to gauge both their mathematical ability and their ideas on social justice, though we only evaluated the surveys of students who chose to participate in our study (See Appendix B). This did not include specific math problems, but instead asked students to describe their experience with math and social justice activism. The survey also asked students to place themselves on a matrix of social and conceptual leadership used in a social justice leadership training program for Ford Fellows (Tirmizi, Unsicker, Khan, Solomon & Williams, n.d., p.18). We chose this because we felt it gave a clear visual example of the type of social justice we would be asking students to engage in through the course. We also hoped that this would help generate discussion, both in class and in individual interviews. A post-course survey with similar questions was given at the end of the trimester, so we could judge how students self-assess their own growth in mathematics and social justice (see Appendix C).

In line with PAR methodology, during the class Bryan and I did not sit in the back taking field notes, but instead were talking with students about their work and interacting with Morgan. I made few field note jottings during class, but after each class meeting I wrote, detailed field notes. These field notes included observations of behaviors, recollections of conversations with participants, as well as reflections. My reflections included impressions and feelings, things that cannot be 'proven' with observable data, but that can be seen as data using a queer methodological framework (Talburt, 1999). Though impressions are generally seen as an acceptable component of field notes (Goodall, 2000, p. 98), in queer methods they are given more weight. Additionally, we collected student work, including paperwork and screen shots of online work. Lastly, we chose four students (one fifth grade boy, one sixth grade boy, one sixth grade girl, and one seventh grade girl) to conduct interviews with in the beginning of the course

and at the end, to see if their feelings about math, social justice, and activism changed. These students were chosen (from those who had returned their IRB forms at the time of the first interviews) intentionally to get a variety of opinions (i.e., students who did like math and those who did not) from a range of grade levels. These interviews were audio recorded. See Tables 6 and 7 for our interview guides.

Table 6
*First individual interview guide**

Interview questions included:	
1.	(From pre-course survey results) You said in the beginning of the class you felt _____ about math. Has this course changed your view at all?
2.	How is this math different from math in other courses?
3.	Do you feel there are more math skills you need to learn for this class? What are they?
4.	How does your school talk about social justice or serving others? Is it a school value?
5.	How do you feel about serving others?
6.	Have you done any service for others?
7.	How can math help you serve others?
8.	What do you think about the class using group work?

*Note: Interviews were conducted between 9/25/2014 to 10/7/2014

Table 7
*Second individual interview guide**

Interview questions included:	
1.	On your reflection [post-course survey] you said ___ about social justice. Can you expand?
2.	On your reflection [post-course survey] you said ___ about math. Can you expand?
3.	Have your ideas or feelings about social justice changed from this course?
4.	Have your ideas or feelings about math changed from this course?
5.	Have you changed from this course?
6.	What math skills do you think you need for social justice?
7.	Do you notice social justice issues more now?
8.	Does your school do social justice?

*Note: Interviews were conducted between 9/25/2014 to 10/7/2014

Data Analysis

Field Notes

Bryan and I planned to compare our field notes, and take notes on notes (Denzin & Lincoln, 2005) in a weekly meeting. Meetings allowed us to see emerging themes, as well as assess if students' skills were progressing. These meetings also informed the evolution of the course- if students seemed invested in a particular social justice issue, or needed reinforcement of a certain math skill, we adjusted accordingly. Our notes also informed us on students' literacy skills and needs. By participating in student conversations about news articles, we assessed if students were understanding the basic information included and also if they were evaluating texts for biases, power structures, intended audience, or for what information or groups are left out of the discussion. Throughout the course we discussed our findings with Morgan, so when necessary she could use them to help guide instruction. Furthermore, in keeping with queer methods, we discussed our impressions and intuitions from classroom observations, which did not necessarily correspond to observable data (Cruz, 2008; Gorman-Murray, Johnston, & Waitt, 2010; Talburt, 1999).

Interviews

Interviews were transcribed in full. Qualitative research software (MaxQDA) was used to code the transcripts. We had originally planned to both code the interviews, but in the end they were only coded by me. I used both open coding, including using in vivo codes, to see what themes emerged (King, 2008). However, I also used deductive coding (Gilgun, 2005) to see if there was evidence of a social justice mindset, queer pedagogical understandings (blurred lines, examination of boundaries and limits), critical literacy skills, or critical math skills using codes found in the literature. I viewed the data from a "conceptual model…composed of a loose set of

ideas and concepts derived from one or more sources" (Gilgun, 2005, p. 42), which fit with the post-critical model of fluidity. The deductive codes were taken directly from my research questions.

Student Work and Discussions

During each unit we collected student work and audio-recorded student discussions, though originally I had planned to only do this for one focal unit. The recordings were transcribed and coded in the same manner as interview transcripts; however, I did not always transcribe these in full and instead made transcript logs, only fully transcribing some parts of the recordings as I used them in the data analysis. Student work was used to support the findings from the student discussion data and my field notes. Other forms of student work included photographs and field notes of questions and answers students wrote on the board. The student work also allowed us, and Morgan, to assess if students were (a) critically analyzing articles on social justice, (b) using their mathematical skills to evaluate topics of social justice, and (c) how they are communicating their ideas on social justice and the mathematical support for these ideas with each other (and in some cases an online audience).

Triangulation of Data

Using the field notes, interview transcripts, and student work and discussions allowed me to triangulate my data analysis. This made it more likely that my analysis encompassed difference, as I acknowledge that there is never one 'real' truth to complex social situations. As Coffey and Atkinson (1996) wrote, "variety does not imply that one simply can take the results from different analyses and stick them together like children's building blocks in order to create a single edifice" (p. 14). Again, I did not conceptualize of triangulation as a way to use multiple data points to find one 'truth,' but instead used these multiple points to create a discourse of

difference among the data, in line with queer methods. I used three out of Denzin's (1970) forms of triangulation: investigator, theoretical, and methodological.

Reporting

While Bryan and I hope to write articles together about our research, my dissertation is a solo writing project. However, it will be necessary to use "we" when talking about project design, data collection, and even data analysis. I incorporated an ethnographic narrative format to describe the course- weaving through analytical themes within the project from its origins to our final interviews with students, and including my reflections and discussions with Bryan and Morgan. Though some queer methodologists recommend using autoethnography (Jones & Adams, 2010), that was not appropriate here as I am not seeking to describe only my own experience, but instead those of the students and collaborating teacher.

Ethical Concerns

We made every effort possible to insure the privacy and safety of our participants. As previously stated, our project met IRB approval, and the assent and parental permission forms insured that both parents and students understood the study, and what was asked of them if they participated. We also carefully monitored students in class, along with Morgan, to insure that students never used any identifying information when posting (or attempting to post) work online. Additionally, we kept an open dialogue with Morgan throughout the course to share impressions and findings with each other.

Addendum

When the study actually occurred, there were many changes. Two I will discuss here, and others will be discussed in the analytical chapters. First of all, it was not as collaborative as I had planned. Morgan was busy with her other classes, and did not create many course materials.

She saw the class as belonging to Bryan and me, and instead of co-planning all the curriculum preferred for us to take the lead. She intervened when she thought something was not working, and planned math lessons as needed, but was not often a driving force. However, did follow PAR methods of sharing data with Morgan. When we planned the course, we shared a blinded transcript of the student focus group. During the course I shared with her data from student conversations I transcribed. This was done through informal verbal reports, rather than giving her transcripts to read, to respect her time. Morgan, Bryan and I also engaged in reflective conversations after each class to discuss what went well, what we should change, and what we wanted to do in the next class. Furthermore, Bryan was simultaneously completing his comprehensive exams and teaching a university course, and so was only able to attend the course once a week instead of both days. Additionally, due to his other commitments he was not able to code data or transcribe audio. We did have many reflective conversations where we processed our initial thoughts about the class and looked at student work together, though these meetings were not weekly, and he was not able to participate in the data analysis. Thus, my collaborative project became more of a solo project with Bryan and Morgan providing help and feedback. This reinforced that it is not enough to want to collaborate, your collaborators have to be equally invested for it to work as planned.

Another major change was a lack of online participation. While Bryan and I had planned for the major part of the study to focus on students' interactions with an online public as they shared results from their mathematical calculations, this proved to be impossible. One reason was that students rarely finished their math problems, and instead ended up with a more conceptual idea rather than a finite answer. This was partly because it was more difficult than we had anticipated for them to create a problem and simultaneously sift through data to find the

information they needed to solve their problem. Because of this, no online sharing occurred, with the exception of one group who made a website for their final project. Another group was trying to share their reactions to an online article (though not their math problems), but the site managers did not approve their comments and so they never appeared. While initially Bryan and I were focused on this end point, I found in my analysis that the process of trying to reach that end point was more interesting and valuable. Perhaps if a course like this was repeated the online interaction could occur, but it would probably have to happen in a more open format, such as YouTube, where comments are not as heavily moderated.

Interviewee Choices

Bryan and I chose four students to interview: once during the beginning of the course, and again after the course. Our choices were limited as some students had not returned their consent forms when we were ready to interview (between 9/25/14 and 10/4/14): there were students I wanted to interview, but some of these turned in their forms near the end of the course. Despite not all returning their forms, the students had all told me verbally if they were participating or not and we ensured them that if they were not participating we would not use any of their quotes or work.

We wanted to make sure we interviewed at least one student from each grade (5-7), and we decided to ask two boys and two girls. Bryan is interested in gender differences in math interest and participation and may use these interviews for a later project. Two of the fifth graders, Jimmy Smith and Aiden, were participating and we chose Jimmy Smith as the interviewee. He was talkative and engaged, making him a good candidate. Aiden was also interested in the course but had problems focusing, so we did not think that sitting for an interview would work well for him. We chose two sixth graders because all four of them had

turned in their forms, as compared to two out of four seventh graders. Ally, a sixth grader, was chosen because she is talkative and enjoys math. Sum Dood was also chosen from the sixth graders because of his engagement and his love of the subject. I did not choose Ashley because she is a people pleaser, and I was afraid she would answer our questions the way she imagined we wanted them answered. Rosette was not chosen because though she was talkative, at this point I had not talked with her much myself and could not gauge how she would respond in an interview. Our choices for seventh graders were Mia or Izzie. While they were both quiet in group discussions, so I was not sure how either of them would feel about being interviewed, I approached Mia because she was one of the few who in the beginning of the course survey indicated she did not like math, so I was interested in her perspective.

PART 2

CHAPTER 4: ANALYSIS INTRODUCTION

As hinted at in the introduction, *Math for a Cause* took many unexpected turns and led to an analysis that strayed from the initial research questions. While I expected to look for evidence—and counter evidence—that followed tenets found in the literature of the various critical pedagogies used, this turned out not to be the bulk of the analysis. Instead, I focused on new tenets and themes that stemmed from a queer space, but did not follow my expectations of queer pedagogy. I, and my research project, were queered by the experience.

To prepare the reader for these chapters, I begin Part 2 by reviewing the school context and how it relates to The Anchor School's Quaker foundations. These Quaker values will be woven through the analysis as well. In the following chapter, I will describe the way students were enacting learning, which I term *processing*. From here, I will give an introduction to the major analytical themes that processing produced: *recognizing the puzzle, abandoning closure, and resisting the average*. Lastly, I will discuss the accomplishments and challenges from the study.

School Context

The Anchor School is a private K-12 Quaker school located in North Carolina. It is in a rural area outside of a major metropolitan area, surrounded by woods and small farms. The middle school, where my study took place, houses students in grades 5-8. As previously discussed, The Anchor School was founded on Quaker principles and continues to incorporate these principles into their mission. Some of the main values that come from this Quaker background are valuing silence, being inclusive, peacefulness, and seeking truth. The school had

a weekly Meeting to discuss topics, which some students said may include social justice topics, but according to the same students staff never discussed why these topics were important or why the school community should be inclusive of others.

When you walk into the school at lunch, especially if you are used to public schools, it seems like barely-controlled chaos. Kids are spilling outside on benches and in the surrounding woods, playing ball, jumping in the creek, hanging out in the large central space of the building, and eating from lunch boxes: there is no cafeteria. Ownership of the space and materials falls to the students; I did not witness the teachers laying claim to their classrooms in a typical way. Students tended to move freely about the grounds. They hung out in small social groups, but it was less obvious than at other schools how those groups were defined- there were no discernable 'jocks' or 'nerds,' at least not to an outsider. The students treated each other well, remarkably well for middle school students where often teasing and bullying run rampant. As such, there was a strong sense of community present in the way they interacted with each other. Students seemingly talked among different groups with ease.

But under this happy picture of comradery lied a feeling of unease. Looking around at the staff, we noticed that they were all white. The student body was largely white too: in the approximately 150 students there were only a handful of students of color. I found myself looking for them, for surely there were more hiding somewhere? For a school that claimed to value diversity and inclusion, it was not visually inclusive. On the school website was a slideshow featuring students of color, but these were misleading. This whiteness would show up in class discussions, as students did not know how to talk about race. Conversely, they could easily discuss sexual orientation, which in the southern U.S. is typically considered to be even more of a sensitive subject than race.

The absence of outright political commentary in school may stem from Quaker beliefs as well. As Birkel (2004) noted political discussions are frowned upon, as "words rooted in these passions tend to burden others with a feeling of guilt. Meeting for worship is not the occasion for political persuasion" (p. 49). This also relates to the Quakers method of solving problems--through deliberation that leads to one hundred percent agreement-- really being a method of conflict avoidance (Bradney & Cownie, 2000). Birkel (2004) also noted this seeking of one truth when solving problems: "Friends expected to be led into unity with one another as well as with biblical forebears. God would not lead the faithful into conflicting or contradictory action" (p. 55). With social justice issues rarely having an easy solution, perhaps this was why teachers avoided bringing them up in school meetings or as part of the curriculum. While I do not know how many teachers, if any, identify as Quaker, I wonder how much influence the school's Quaker mission influenced school dialogue. Some teachers were Quaker educated themselves (as they wrote on their biographies posted on the school's website), so this avoidance of difficult topics may come from reflecting on their own schooling experiences. While staff participated in professional development opportunities that engaged participants in deep discussions on race and privilege, it was not clear—at least at the middle school level—that they were having similar discussions with students.

Course Context

The course, titled *Math for a Cause,* was offered as an elective for 5th through 7th grade students (the eighth graders had a required course during the time we met). The course was held on Tuesdays and Thursdays during seventh period, which is the last period of the day. This time slot gave us some problems with attention span as well as students leaving early to compete in

sporting events. The class was held during the first 10-week trimester of the 2014-2015 school year.

There were 12 students in the class, and 10 participated in the study. Table 8 lists student demographics. We covered three instructional units over the 10-week trimester that focused on current social justice events and were often guided by student interests. The units were: 1) Ferguson and the killing of Michael Brown, 2) student-group choice between: marriage-equality, environmental issues, education, or healthcare, and 3) marriage equality. Same-sex marriage became legal in our state during the trimester and the students were already talking about it at school, so focusing on it for the last project was a natural fit.

Each the first two units followed a similar instructional pattern. First, the students read news articles about the topic. As they read they completed scaffolded handouts that focused on critical literacy by asking them to answer questions such as "Who has the power?" After this, they would brainstorm and create a math problem inspired from the article, and conduct more research as needed. For example, in the second unit one group wanted to find out if there is a correlation between student achievement and school funding. Often, the math portion was difficult as the students had to sift through data and try to 'read' the numbers. As such, students did not usually finish their math problems, but they learned a lot from problem-creation and solving. For the last unit, students created a presentation (either videos or a website) using math about marriage equality. Throughout the course, students worked in groups of three to five on both reading articles and creating math problems. Occasionally, we would conduct whole-class math lessons. Whole-class discussions happened during and after each unit giving students time to reflect and dialogue on the topics. Figure 4 illustrates the class process.

Table 8
Participant demographics

Name	Age	Grade	Legal Sex	Gender Identity	Race
Aiden	11	5	M	M	White
Ally	11	6	F	F	White
Ashley	11	6	F	F	White
Izzie	12	7	F	F	White
Jimmy Smith	10	5	M	M	Mixed race
Justin Case	12	7	M	M	White
Mia	13	7	F	F	White
Rosette	11	6	F	F	White
Sue Denim	12	7	M	M	White
Sum Dood	11	6	M	M	Mixed Race

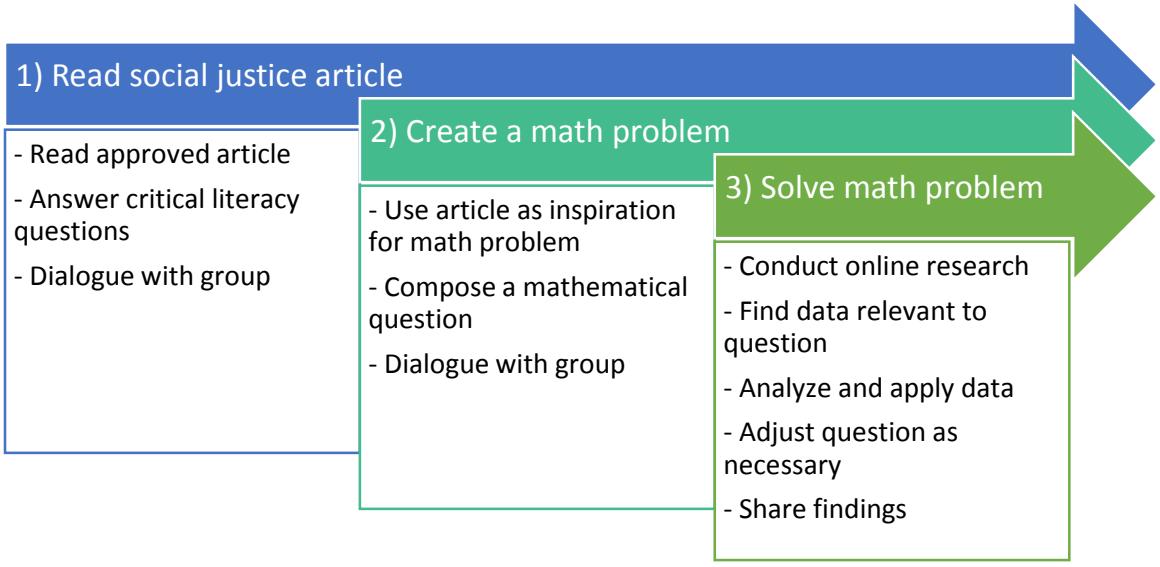


Figure 4. Student process for class units

CHAPTER 5: PROCESSING: THE QUEERED ENACTMENT OF *MATH FOR A CAUSE*

Throughout the study, I was constantly paranoid that I was not doing enough for the students. We were covering heavy topics, and I wondered if it was too much for them, or if we should scaffold things more carefully. Was I hurting or hindering learning by not having more traditionally scaffolded and structured lessons? Was Morgan going to be faced with an angry parental mob demanding to know what their children were doing in class? Yet despite my fears and feelings of inadequacy, something *was* happening. Students were having great conversations with me about racism, sexism, and homophobia, and were asking thoughtful questions. They had creative ideas about math problems, even if they were not always able to solve them. I wondered if, in spite of ourselves, we were creating an environment that fostered learning. As I listened to audio recordings, it became apparent that learning was happening primarily through the student-centered and student-led working groups, as they processed each topic together.

As the course progressed I realized that when students were having deep conversations with each other, this was not necessarily showing up on their written work. My richest data pieces are from interviews and student conversations, rather than their finished products that resulted from these conversations. Looking back on this, the reason seems obvious: the discussions were for themselves, while the written work was for the teachers. Of course the students were not concerned about making their work reflect their long conversations, that written record did not benefit their learning and was not seen as valuable. While this richness of conversation is likely true of many learning environments, it struck me as particularly important in this setting because working with social justice topics requires a high frequency of cognitive and emotional processing as evidenced by the emphasis on reflection (e.g. Miller, 2008). Further, this

processing did not have to be serious: there were several moments of play when the students imaginatively engaged with the material or the research process in fun and spontaneous ways.

What is processing?

Mia (seventh grade girl) gave an excellent description of math in her second interview which fits well with the concept of processing as a mechanism for learning:

> Summer: So about math [in reference to the student reflective survey] you said it means to figure out problems and diagrams, it's like a puzzle, and you said you'll always be trying to understand it.
> Mia: Yeah. So, I guess, no one is actually done learning math or an expert on math because you're really always learning. .. And no one will understand it all.
> Summer: Can you say more about the big puzzle?
> Mia: Well I guess to understand concepts or something you start piecing things together. And it's kind of like… one piece fits and one doesn't, and one method works and one doesn't. So it's kind of like a puzzle then. But when you have the puzzle, you have the concept. A better understanding." (personal communication, Nov. 14, 2014)

As Mia described, processing can include a lot of trial and error, which requires creativity and ingenuity. And when "you have the puzzle," you can have "a better understanding" of the concept you are investigating, but that understanding will not be complete as "you'll always be trying to understand it."

Processing is a colloquial term used in queer communities, especially women-identified queer communities, to describe discussions about emotions, most often conversations about relationships between partners (Yip, 2008). In cognitive psychology, processing is related to how the brain processes information and memory. A popular model states that we process information through a series of steps, starting with "perception, through attention, to labeling, and finally, meaning" (Huitt, 2003, para. 2). I am using the term processing as somewhere in between those two conceptions, and focusing primarily on three key elements I observed: *dialogue*, *reflection*, and *engaged play*. While these elements are distinct, there are not rigid boundaries between them and several examples in this section could be used to describe more

than one element. Further, processing is something that is continuous that can leave a topic without a clear resolution. It may not follow a formulaic staged procedure such as suggested by psychologists and is queer in its manifestation. This chapter will explore how processing relates to queer pedagogy and theory, and then give examples of each of the three components from my data.

Processing relates to DePalma's (2010) work in queer pedagogy, particularly when he discussed that allowing questions to remain hanging without rushing to resolve them can create rich classroom experiences. Because processing is ongoing, it fits well into a queer schema that does not hold for easily tied together endings. Luhmann's (1998) work on queer pedagogy is useful when thinking of processing as part of learning:

> What is at stake in a queer pedagogy is not the application of queer theory (as new knowledge) onto pedagogy, nor the application of pedagogy (as new method) for the dissemination of queer theory and knowledge. Instead, at stake are the implications of queer theory and pedagogy for the messy processes of learning and teaching, reading and writing. Instead of posing (the right) knowledge as answer to the solution, queer theory and the pedagogy … pose knowledge as an interminable question. (p. 151)

As Luhmann (1998) posited, questioning is at the heart of queer pedagogy. Mia related this in her description of our class, and I saw it as I listened to student conversations and noticed they were constantly questioning the material, their opinions, their school, and each other as they grappled with difficult social justice topics. Learning and teaching are messy, and it was precisely this mess that lead to our delightfully surprising student outcomes. Without the mess, without letting the students process information on their own through dialogue, reflection, and engaged play, they likely would not have gained such a sophisticated understanding of math and social justice.

What does not count as processing?

Before I illustrate how processing was effective, I want to give a counter example of student talk and activity that was not conducive to learning, and so not coded as processing. This short excerpt from a transcript of a group conversation at the end of the term shows shallow dialogue, reflection, and unengaged play did not help or lead the students through their work. This group had chosen to make a video about LGBTQ bullying for their final project.

> Students: [Singing "Rudolph the red nosed reindeer"]
> Izzie: Guys, guys!
> Students: [singing] "They never let poor Rudolph, join in any reindeer games. Like monopoly!..."
> Izzie: We actually need to finish this ....I'm not asking you to do anything besides brainstorm... After you say "gay is OK" you would say something about all the like the facts you just learned or something...And then you could say "because GL [gay and lesbian] teens are two to three times more likely to commit suicide as kids, and five times as likely to skip school" because um... and then me or Mia could say, could just split up these facts. Does that sound good?
> Mia: [She] can also say some facts.
> Izzie: I just said those facts are for [her]
> Mia: Oh.
> Izzie: [She] says these two, and we split this. Can you write it because I have terrible handwriting?
> Students: [singing] "Over the river and through the woods, to Grandmother's house we go"" (transcript, Nov. 4, 2014).

It is clear from this excerpt that Izzie is trying in vain to have a dialogue with her group members about their project, but they are ignoring her pleas and continue to sing and play. She is also beginning to reflect on their working process- "Does that sound good?"- but as her classmates are refusing to engage with her, there is no reflection on how they will divide the work, let alone on the topic itself. Finally, there is play happening but it is not related, even tangentially, to the work at hand. Thus by continuing to sing a song, Izzie's classmates were playing but not engaging with the material.

Fortunately, there were many more examples of student work that was engaged, and so fall into my category of processing. Again, while the elements laid out by cognitive

psychologists were in place in our class (perception, attention, labeling, and meaning) the most interesting parts of processing-- dialogue, reflection, and engaged play-- were outside of these elements. In the following sections, I will define each of these key elements, demonstrate how they are connected to queer pedagogy, and provide examples from the course to illustrate how the students worked with them.

Dialogue

Dialogue in the classroom (also called classroom discussion) has been studied by many scholars, including Bakhtin (1981), Applebee, Langer, Nystrand, and Gamoran (2003) and Daniel and colleagues (2005). Bakhtin (1981) described dialogue as "struggling with another's discourse" (p. 348). Dialogue occurs when students are having discussions, with or without a teacher present. Applebee and colleagues (2003) defined open discussion as "

> free exchange of information among students and/or between at least three participants that lasts longer than 30 seconds. To have a dialogue, all participants need to be engaged in discussing the same topic, rather than interrupting just to change the subject or spouting non-sequiturs. (p. 700)

Daniel and colleagues (2005) were more specific in their investigation, and defined dialogical critical thinking as "a process of (e)valuating the object of thought, in cooperation with peers, in an attempt to eliminate irrelevant criteria in order to contribute to improvement of experience" (p. 352).

I am not using Applebee and colleagues' (2003) time or participant specifications, or the specificity of Daniel and colleagues' (2005) definition including critical thinking, because my conception of dialogue in this study comes from the students. Our course was designed to allow for student-centered dialogue, so I was also uninterested in the Initiation (teacher poses a question) Response (student gives answer) and Feedback (teacher gives a response to the student answer) or IRE model described in much of the literature on classroom dialogue (Howe &

Abedin, 2013). In this study, dialogue is defined as when all participants were carefully listening and responding to each other. The length can vary, and the topics may wander but a general focus on the issue at hand remained and/or was drawn back by the end of the conversation. In our classroom, dialogue happened most often when students were working in small groups, though it also occurred in larger class discussions. Dialogues were fruitful when all students present were engaged, actively listening, and providing careful responses and reflections in a desire to understand a problem or concept more clearly, or at times convince the other students to take their point of view. There were times when one student in a group was attempting to dialogue about a topic and was having no response from their peers, resulting in a one-sided conversation.

Student-centered dialogue is commonly cited by queer pedagogy practitioners (and critical literacy and math scholarship) as vital to student learning (Krywanczyk, 2007; Jacobi & Becker, 2013). Allowing students to engage in dialogue with each other not only prioritizes student talk over teacher talk, but it also helps shift the power dynamics from the teacher to the student. It can also allow students to struggle with difficult material (Jacobi & Becker, 2013; Kumashiro, 2001). Britzman (2012) pointed out that dialogue also happens during reading, in that "reading becomes a practice of constituting the criteria that make the self and that make another both intelligible and unintelligible….requiring something more than the self in order to think the self differently" (p. 304). Both reading texts against each other in a dialogic way, and having a verbal dialogue with others, give students that "something more than the self" to help them discover and recognize themselves and others.

To illustrate this dialogic element of processing, I will share a lengthy excerpt from a conversation between Justin Case (seventh grade boy), Sum Dood (sixth grade boy), and Ashley

(sixth grade girl) that shows them dialoging about an article called *Why So Many Christians Won't Back Down on Gay Marriage* (Gobry, 2014) to think through their understanding and analysis together. Morgan (and to a lesser extent, myself) comes in and out of the conversation, showing how the teachers can participate in this dialogue to assist student understanding. This conversation is from Sept. 25, 2014, during the second unit where students chose their own topics. These students picked marriage equality as their focus. As the conversation progresses, it is evident they are answering questions from a handout (see Appendix D for their completed handout). Ellipses indicate where part of the conversation has been cut and brackets indicate my notes.

> Ashley (sixth grade girl): So, um, we're doing the first question which is what does the author write as having the power?
> Morgan: What or *who* does the author write as having the power.
> Ashley: Well, I haven't read it all the way through yet so I don't really know, but-
> Sum Dood (sixth grade boy): I kind of just guessed that it's most likely Christians.
> Ashley: It's most likely Christians cause, well, it's kind of an off subject that you wouldn't really think about unless you were someone who'd do that. And Justin Case just said that not every Christian is anti-gay, so it wouldn't, it's just because of the Bible, they don't mention it. I feel like just because the Bible doesn't mention it, I mean I haven't read the Bible so I don't really know, but I'm guessing they don't.
> …
> Morgan: Well it does mention it, and it says that it's a sin. That's why so many people, that's why it's a big Christianity versus non-Christian. That's why it's a religious topic, or has become a religious topic.
> Ashley: I just don't get why it is religious. I mean I get it's in the Bible, but-
> Morgan: Yeah, but you know what? There's a lot of other things in the Bible that we don't do.
> Justin Case (seventh grade boy): Like slaves.
> Morgan: Slaves are in the Bible.
> Sum Dood: Yeah, like bad stuff.
> Morgan: Um, some things about men being superior to women, that's in the Bible.
> … [Morgan leaves]
> Ashley: The questions are, who has the power.
> Justin Case: So write down Christian. And we know that, because the Christians are the subject of the article, meaning that they're getting attention which is what they want.
> Ashley: Say that again…

Justin Case: Christians have the power in this article because they have influence over the author to write this article. Obviously.
…
Sum Dood: I think he's [the author], he's, I think he believes what the Christians think because…Actually, no. Actually, I think he's actually really good. I don't think, yeah, he's not-… OK what do the author or people interviewed see as normal? …
Justin Case: [singing] They see me rollin', they hatin'
Sum Dood: They see gay people as not normal….Are the opinions in this article different from your own? I don't know really. It doesn't say the opinion. It don't say the opinion [writing sounds] It- does- not- say- his- opinion.
…
Justin Case: What is your reaction to the article?
Ashley: That they don't give us any actual information that we didn't already know.
Justin Case: Write that.
…
Ashley: So what were the beliefs of the author, how do you know? … Ok I wrote the author, he doesn't give much with beliefs… What do you want readers of this article to know about your topic? It's not that helpful!
Sum Dood: Um, don't read this this is a waste of time.
…
[Morgan and Summer enter room]
Morgan: Alright, so tell me about this article.
Ashley: It was terrible.
Sum Dood: Yeah, it actually wasn't a very good article.
Morgan: Was it informative?
All: No.
Morgan: No, not informative.
Ashley: It didn't give us any information we didn't know except for two things.
Sum Dood: It gave us two things.
Morgan: Okay.
Sum Dood: And they-
Justin Case: And it repeated what we already know.
Morgan: So-
Sum Dood: It repeated so much stuff.
Morgan: So, what beliefs came across?
Sum Dood: We didn't find really any beliefs.
Morgan: No?
Ashley: There were beliefs like-
Justin Case: They believed Christians were in the wrong for not backing down on gay marriage. That was about it.
Morgan: They believe that Christians are wrong for not backing down on gay marriage.
Justin Case: Yes.
Morgan: Okay, interesting.
Sum Dood: Okay, when I read it I thought it was more like,
Ashley: I didn't read all of it because I was just like, I say the same thing in different words, all the way through.

Sum Dood: Yeah, that's all it said.
Ashley: And it was all these complicated words I didn't know.
…
Morgan: OK, so- so in this article, what does the author see as normal? Or perceive as normal?
Justin Case: Um, gay marriage being OK.
Morgan: So gay marriage being okay was the norm for this? It says [pointing to their paper] they see gay people as *not* normal.
Sum Dood: Oh, we were going by the people like interviewed- like-
Ashley: The Christians!
Sum Dood: As in the Christians. Like the Christians, they see gay people as not normal.
Morgan: So it seems you didn't get a whole lot out of this article.
Ashley: I didn't.
Justin Case: We didn't.
Morgan: You know what that makes me want to say?
Ashely: Redo it?
Morgan: Find another one?
Ashley: No!
Summer: Yeah, you don't have to stick with something if it's not working for you or it's too hard.
Sum Dood: I actually think that's why it took us so long to do it, because it just wasn't really something, so we had trouble actually paying attention and not just doing random stuff.
Morgan: … I want you to find something that really gets you fired up.
Ashley: It got me fired up when I saw this whole thing, but,
Morgan: But maybe this was a little too, words were too,
Ashley: Complex.
Sum Dood: It wasn't really the words were too big,
Ashley: Just the understanding-
Morgan: So it didn't really seem to have much of a message?
Sum Dood: It was essentially a one-paragraph thing that was put into a bunch of paragraphs.
Morgan: And I don't care if you're being fired up as in yeah, 'yeah I agree with him, that's such a good point' or 'Oh my God I can't believe they said that, that's so ignorant,' but I want you feeling something. I don't want you to leave feeling 'this is so boring I just have to answer these questions,'
Sum Dood: We are feeling something. Boring. We're feeling boredom.
Morgan: So what specifically about gay marriage gets you guys fired up?
Ashley: When people don't like equality
Sum Dood: It gets me really fired up about like, just like they, I can understand if they said they weren't like, I will never be gay or something, they will never be gay, but I don't see why they, I don't see why they make it that *everybody* can't be gay.
Morgan: Who is they?
Sum Dood: Christians.
Morgan: So what if you looked for an article that's a Christian explaining why he believes that gay people are bad? Or why he or she thinks that gay marriage is wrong?

Sum Dood: I'm gonna search why gay marriage is bad and see what comes up.
Morgan: Probably ought to be careful with that!

This is a rich text, and has examples of metacognition, reflection, and engaged play, but here I want to point out the ways in which dialoguing helped the students' learning process. Though they were struggling with the article, as the reading level was too difficult for them, they were still able to use their critical literacy skills to discern who had the power. Even though Ashley did not read the article, she knows how to use the title and relate it to what is happening in the world, so she notes "It's most likely Christians." Later, Justin Case stated "Christians have the power in this article because they have influence over the author to write this article. Obviously." So while it is unlikely that a writer at *The Week* is directly influenced by conservative Christians to write an article, Justin Case does understand that in the article they are depicted as having power, and that attention is something they want.

The students also did know something about the author's beliefs, even though they did not think they did. Through dialogue, Sum Dood realized that the author did not agree with the Christians on gay marriage: "I think [the author], he's, I think he believes what the Christians think because-Actually, no. Actually, I think he's actually really good. I don't think, yeah, he's not." In this case, we can witness his reading comprehension as it unfolds. Even though his classmates do not respond to this declaration, talking about it out loud helped him come to this realization. This supports a common strategy reading teachers use: asking students to think aloud to help students' process their learning (Oster, 2001).

This excerpt also shows how the teacher can assist students in their thinking process. Through Morgan's guidance— "what specifically about gay marriage gets you guys fired up?"— the students articulated why they were interested in creating a math problem about gay marriage. When Ashley and Sum Dood answered using vague words like "they" and "people," she asked

them to clarify and they said “Christians!” While it can be argued that Morgan could have gone further and facilitated a discussion about different types of Christians, and pointed out that many Christians are affirming of LGBTQ people, by letting the conversation be about the students’ personal interests in the subject she got them excited about the topic again.

Additionally, through dialogue they were able to discuss the learning process itself, and discovered *why* they were having trouble with this particular activity. Daniel and colleagues (2005) described this type of dialogue as metacognitive. Ashley explained that “it was all these complicated words I didn't know” which made it difficult for her to understand the larger purpose of the article. As Sum Dood said, “I actually think that's why it took us so long to do it, … we had trouble actually paying attention and not just doing random stuff.” I was amazed that he could articulate that the reason they got off task (which is often what the ellipses in the excerpt edited out) was directly related to the difficulty of their reading material, and not about the task itself or the subject matter.

This excerpt is but one of countless examples of the students dialoguing as they worked together to understand complicated texts and ideas related to social justice. If they had been reading silently to themselves, they may have gotten even less information from the high-level text. As stated earlier, because the richest data is from discussion, most of the examples of reflection and engaged play also came out of these dialogues, showing how these processing elements are intertwined and do not form a linear progression.

Reflection

Reflection means you are thinking about your role or stake in regards to an issue or topic. It is an emotional process requiring internal critique. Reflections can occur in dialogue with others, but that is not a requirement. It is also a common tool used by critical and social justice

educators (Freire, 2000), and it is often highlighted in queer pedagogy. Luhmann (1998) suggested asking students to reflect on not only their feelings about a topic, but to go further and question "What does this information do to one's sense of self?" (p. 150). Winans (2006) used reflection with college students to ask them to examine their own discourse communities' concepts of normal. Britzman (2012) suggested that queer pedagogy can help examine one's emotions, and

> requires attention to what it is that structures the ways in which feelings are imagined and real…That is, pedagogy might provoke the strange study of where feelings break down…pedagogy might become curious about what conceptual orders have to do with affectivity and with what reading practices have to do with proliferating one's identificatory possibilities and modes of critique. (p. 296)

In other words, processing our feelings' structures through reflection might tell us *how* we are identifying and critiquing what we read. While this was not always happening in our study, there were times when students, such as Ally (sixth grade girl) and Sum Dood stated that they were beginning to question why the school wanted them to feel and believe certain things (Ally) and why others believed differently (Sum Dood). They were not quite questioning how their own feelings were shaped necessarily, nor how their identifications were influenced by this shaping, but were beginning to realize that feelings are created by our environment and how we read the world. This type of thinking can allow students to learn how they are implicated in a text, how others are implicated, and the spaces in between.

Reflection was both happening spontaneously through students' discussions, and also encouraged by the teachers. Each handout we gave the students included questions that asked them what they felt about the information. However, I realized that waiting until the last question to reflect was not the best strategy, as some groups were not getting to the last question at all. As the course progressed, I added these questions earlier in handouts and we engaged in reflective class and small-group discussions throughout the entire unit (for an example, see

Appendix E for the critical literacy handout used during the first unit, and compare with the completed handout from the second unit in Appendix D). This both helped the students continue to process the information, as well as highlighted for the teachers areas where they needed help, either with the information or the overwhelming feelings that thinking about social justice may produce. Before our last unit, we also asked the students to write anonymous reflections on the class itself so we could best plan for our final weeks together. This section highlights examples of teacher-led reflections as well as conversational excerpts which illustrate students reflecting on their experiences and feelings toward class material.

Reflections on Learning

The students' pre-class survey and post-class reflection show their teacher-led reflections on social justice, math, and their own learning (see Appendices B and C). Rosette (sixth grade girl), in answer to 'How do you feel about math?' on our post-class reflection, stated "In most areas confident, but in more complicated parts, I feel unsure and don't enjoy it as much" (student work, Nov. 11, 2014). This flushed out her answer from the pre-survey, when she answered the question "Do you enjoy mathematics?" with it "depends, but mostly yes." Rosette's reflection shows the importance of comprehension to student enjoyment. Even though we were excited about the students embracing a more ambiguous view of the world, Rosette's statement shows that this does not necessarily increase enjoyment, or at least not in the early stages of this discovery. These surveys also showed that most students felt that social justice was important-- "I think it's really important for everyone to think about" (Mia, student work, Nov. 11, 2014)-- or as a problem to be solved-- "I think social justice problems need to be fixed"-- (Izzie, student work, Nov. 11, 2014).

The interviews conducted with Mia, Ally, Jimmy Smith (fifth grade boy), and Sum Dood gave further illustrations of student reflections on learning. Mia, who in the beginning of our course said she did not like math, finished the course feeling differently:

> I guess I have liked math a little bit more. But I don't know, I've kind of gotten, I've learned more in math class and I've incorporated it with other stuff in the class. So it's kind of more usable, or something?... I'm like seeing ways it can be used in real life and not just math class and worksheets and little practice problems. (personal communication, Nov. 1, 2014)

In Mia's reflection, she related that now she likes math more because she sees its use in other aspects of her life outside of class.

Students also reflected on what social justice meant to them, and how their feelings about it had changed throughout the course. Sum Dood shared that:

> I think they [ideas and feelings on social justice] really changed a lot because when I first signed up for the course and did stuff, I didn't really know what it was. Well, I knew what the class was I really didn't know what social justice was. Like, I know I was part of [the school's Gay Straight Alliance; GSA] and I was for gay rights and all that, but I didn't, I didn't think of it as a social issue. Well I did think- like social justice, I didn't really know what that meant (personal communication, Nov. 14, 2014).

Sum Dood's reflection shows that through the course he was better able to understand his own feelings on gay rights and to understand what those feelings and work meant. He had never thought of the GSA as connected to social justice, but now he knows that it is social justice work and he can better articulate what that work means and why it matters to him. Without reflecting on social justice as a concept, Sum Dood may not have realized that he was already participating in social justice work. While he believed that social justice was worth fighting for, at least in terms of gay rights, connecting it to a broader context helped him understand that gay rights are bigger than his school or local community.

Reflections about Race

Aside from teacher-led reflections where we learned what the students were feeling and thinking about their learning and the course, student-centered conversations showed that reflections were occurring as they processed complex topics. As we began our course discussing the fatal shooting of African-American teenager Michael Brown by a white police officer in Ferguson, MO many students reflected on their feelings about race. For students in a nearly all-white school, talking about race was extremely difficult as most of them had never needed to consider how race affected their own lives. Yet despite their difficulty, and sometimes discomfort, students were able to reflect on racial stereotypes in our country and what they meant for the Michael Brown case. In this short example from Sept. 18, 2014, Ally and Ashley were discussing Michael Brown as they looked for information on the shooting of unarmed black men by police.

> Ally: [Reading aloud from *Exactly How Often Do Police Shoot Unarmed Black Men?* (Lee, 2014) about how the shooting of black males by police needs to stop]
> Ashley: I feel that's really true
> Ally: [continues reading] His parents said-
> Ashley: I feel like that's really true because it's like, they don't really care, I mean usually people try to like...pull like, say like 'he was in a hoodie,' and he you know 'looked kind of thuggish like he could hurt somebody' but he was really unarmed and couldn't do anything.

Ashley is reflecting on what she knows public perception of black males to be, and how she feels these characterizations are unfair. From reading about the case, she knew that Brown was unarmed, so she questioned how fair it was for the officer to see him as "thuggish" when "he was really unarmed and couldn't do anything." When she says "they don't care," she does not only mean racist people in general, but in particular racist cops who see a black male and automatically think criminal. Many times throughout this first unit, students reflected on these stereotypes and how they affected the way people were treated. This reflection helped them see

the problematic racial assumptions that are made on a daily basis, how that connects to broader systemic racism, and how dangerous these assumptions are in the hands of law enforcement.

Reflections about how Information is Perceived

In the following transcript excerpt, Justin Case (seventh grade boy), Sum Dood (sixth grade boy), and Sue Denim (seventh grade boy) are working on their final project on Nov. 4, 2014. They have decided to investigate the relationship (if any) between same-sex marriage and LGBTQ suicide. In this conversation snippet, the boys are arguing about how to present their findings and reflecting together on what the presentation will indicate to viewers of their website. This example also shows how reflections can take place in a rich, playful dialogue, illustrating that the elements of processing work together.

Justin Case: Now write, 'so now we have determined that the suicide rates of states that allow gay marriage is lower than the suicide rates of states that don't. So...if you wanted to lower the suicide rate you could make all states with gay marriage.'
Sue Denim: So what's our conclusion? States that do have gay marriage have lower suicide rates?
Justin Case: Yes. To lower the suicide rate in the US you could just make it so-
Sue Denim: [talking while he types] 'We do not know if the higher suicide rates are related to gay marriage.'
Justin Case: Don't say that Sue Denim.
Sue Denim: But we don't-
Justin Case: This [their website] is to say you should allow gay marriage because it will lower the suicide rate. That does not help with that.
Sum Dood: Is that [correlation] really true?
Sue Denim: Well, what if it's a scam?
Justin Case: Well we still don't want to say that. We want to say, 'to lower the suicide rate we should allow more states to have gay marriage.'
Sue Denim: Oh-kay.
Sum Dood: One thing is, I still think this could be completely wrong.
Sue Denim: Yeah.
Justin Case: ....[Imagine] you have a serum that might kill somebody or it might save them. What do you do, would you give them the serum?
Sue Denim: Yeah.
Sum Dood: Well are they dying? If they're dying I would give it to them.
Sue Denim: They're dying, yeah.
Justin Case: They're not dying.
Sum Dood: Oh. It might kill them or it might what?

Justin Case: It might do nothing to them.
Sue Denim: I would not give it to them.
Sum Dood: Then, no.
Sue Denim: That was an awful analogy.
Sum Dood: If they were dying- that *was* an awful analogy. If they were dying sure I'd give it to them, cause they might live.
[All keep talking about the imaginary scenario.]
Justin Case: Guys, I'm sorry I brought this way off track. But guys, we want it to say 'Hey, let gay marriage be legal and it should lower the suicide rates.'
Sum Dood: No. We *think* it will lower the suicide rates.
[Justin Case and Sum Dood keep arguing about how they should write about their findings on the website.]

This conversation allowed the boys to reflect on their feelings about how information is displayed and what language is necessary to get a point across. As you can see in Figure 5, Justin Case won the argument and they decided to take out any uncertainty in their corollary statement. What their larger conversation illustrates is the boys reflecting together on their feelings about how they present their information. Sum Dood and Sue Denim felt uncertain about making such a bold statement, and felt that it is dishonest, especially when Sue Denim uses words like "scam." Justin Case also knew that it was not completely honest but he felt that was less important than making a strong message. As he tried to articulate in his fumbled analogy about the serum, if a message may save lives then he felt it is more important to make a strong statement even if it might not be true. According to Justin Case, convincing all the states to vote for gay marriage was the 'serum' needed to prevent LGBTQ suicides.

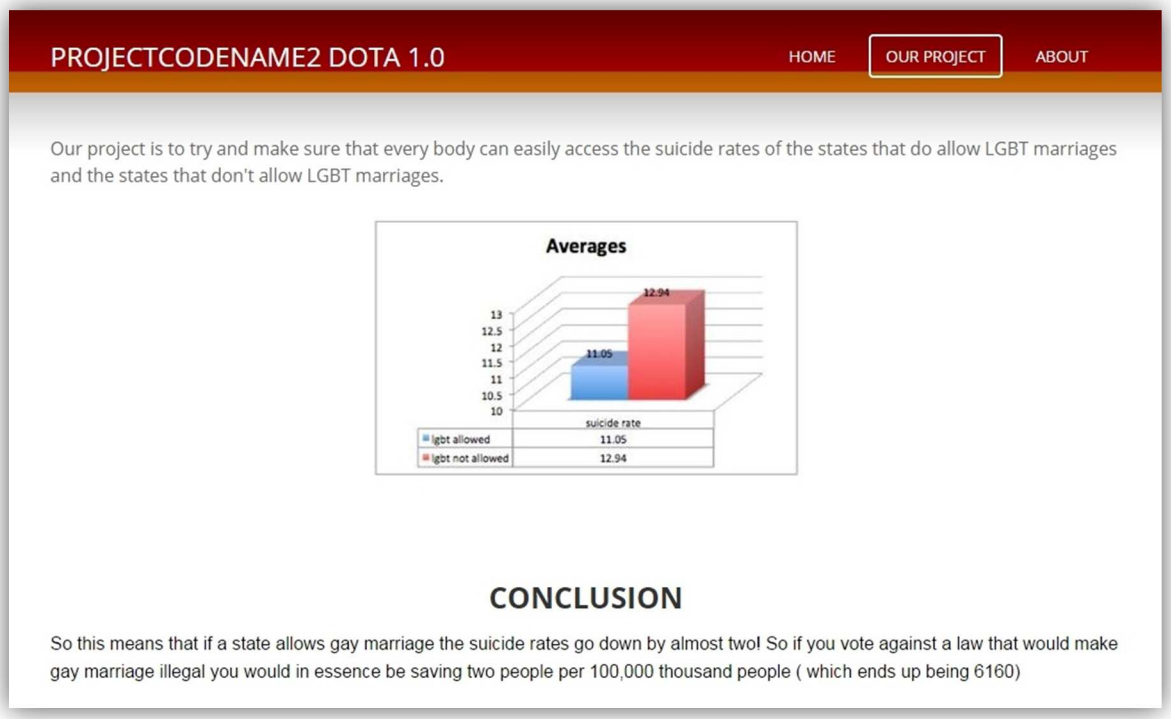


Figure 5. Screenshot of Justin Case, Sum Dood, and Sue Denim's website

Engaged Play

As seen in the previous example, play was a constant part of student conversations. I had to fight my idea of teacher when I saw them playing, as I often wanted to correct their behavior and make sure they were "on task." However, the students continued to queer my expectations of teacher, student, and even what it means to be on task and engaged with learning. As I listened to the audio recordings, I noticed the students were enacting an engaged play. Unlike dialogue and reflection, we did not purposefully include this element in the course design. That is, play did not happen because we were playing a game, but was something generated from the students working together. While there was play that was not part of their learning (for example, students spinning in their chair or knocking on the wall to get the attention of students in adjacent rooms), when students were enacting *engaged* play it was part of their learning and related to the subject matter. A small example from group work is when Sum Dood said he was getting his "calculator

of justice" (transcript, Nov. 4, 2014), referring to their task of creating and solving a social justice math problem.

Much of the literature on play and learning is in reference to preschool and lower elementary, and references Piaget's work (e.g. Wolfgang & Phelps, 1983). Furthermore, much of the scholarship discusses intentional play with toys or manipulatives in math class, which is not what was happening here (e.g. Nath & Szücs, 2013; Parks & Blom, 2014). Piaget's idea of symbolic play is useful in this context, however, as it is defined as "the process of transforming an object or oneself into another person, object, event or situation through the use of motor or verbal actions in a make-believe activity (i.e., a block becomes a telephone)" (Wolfgang & Phelps, 1983, p. 128). Transformation of objects will be described in more detail in the next section on audio recorders.

Engaged play is not found explicitly in literature on queer pedagogy, but it happened here and acknowledging it shifts borders around what can be counted as queer practices. Simply allowing more time for student-led dialogue and reflection may increase the chances of play: as students are given more control they may be less likely to follow a rigid procedure. This new contribution to the literature has the potential to affect student learning and curriculum. Lewis (2012) approached her college classroom in a playful way as the instructor by using a performative pedagogy of embodiment, wearing certain clothes or sharing personal photographs with students to illustrate her own life as a queer black feminist, but this play was limited to her role as professor. In queer activist communities outside of education, playfulness is evident in humorous protest signs and satirical reactions to oppression. Incorporating queer play in the classroom may have surprising and beneficial effects, as it did in our classroom.

In our course, play was happening largely when the students were in semi-private tutor rooms, fitting with Huizinga's (1955) declaration that "one of the most important characteristics of play was its spatial separation from ordinary life" (p. 19). In these rooms, the physical space for play was allowed as they were mostly separate from teachers and other students. Huizinga (1955) also noted three dimensions of play that were applicable here: (a) "it is free, it is in fact freedom" (p. 8), (b) "play is not 'ordinary' or 'real' life" (p. 8), (c) "its limitedness. It is 'played out' within certain limits of time and place. It contains its own course and meaning" (p. 9). Students in *Math for a Cause* were allowed a large amount of freedom to do their work, which is perhaps part of what inspired their play. This play allowed them to imagine a different world as they examined serious social justice topics. Lastly, when they played with the material their playful conversations had their own logic and natural ending, usually within the time limitation of a course meeting. In some cases, the play continued through multiple class sessions. Huizinga (1955) also described play and seriousness as fluid rather than a rigid binary, which allows play to be seen through a queer lens.

Play was evident in student interactions, though sometimes the teachers participated. For example, Justin Case, Sue Denim, and Sum Dood had a running game of pretending they were on a podcast (a radio show you can download from the internet). When a teacher entered the room, one of them would declare "Morgan just entered the podcast" as they addressed an imaginary audience by speaking directly to the recorder. Izzie and Mia, when I was using my iPhone as a recorder for their group, took a picture of themselves, which I only realized when I listened to the recording later and heard them talk about it. I participated by decorating the photo and sending it to Morgan to show them. While this is not necessarily an engagement with the subject matter, it was a way of engaging with schooling and me as their teacher, and by

responding I showed them I was paying attention. These examples of play also challenged my own notions of teaching and learning, as while I am often playful with my students I still tend to have a self-constructed boundary between what counts as play and what counts as work. By playing in this way, the students were performing different ideas of student and drawing me and the other teachers in as both audience and participant. This section contains some examples of engaged play in our course, and relates how they enhanced student learning.

Playing with the Recorders

The play element was first evident when I introduced the audio recorders to the students. I gave them full autonomy, and showed each group how to turn on and off the recorder. I reminded them that I wanted them to leave it on as I was interested in their conversations about their work, but said that they could turn it off it they started talking about something they did not want me to hear. In my field notes, I wrote about their reaction:

> The kids were REALLY excited at the prospect of being recorded and there was chatter about talking in different accents and doing a podcast [digital audio shows available for download from the internet]. I reminded them that I was just interested in their problem solving process so wanted to record their discussions, and that the focus was on the math, not the recording. (field notes, Sept. 16, 2014)

Here, I was worried in a typical teacher way that the students would play too much and forget about their task. Thankfully, they ignored me, and I learned that the play was part of their learning process. In the recordings I hear myself giving them reminders about focusing on the work and not just the imaginary audience, and also reminding them that only I or Bryan would ever listen to the recordings. Despite my attempts to get them to focus on "the work" most of them kept up their imaginative play throughout the course. The 'podcast boys', as I began to call them (Justin Case, Sum Dood, and Sue Denim), were the most dedicated. When Justin Case and Sum Dood were in a group with Ashley in our second unit, they continued the podcast play.

However, their talking about or to the microphone was not always enthusiastic. The way the students behaved towards the microphone depended on context. In general, most students left on the microphone regardless of how they felt about the work at any particular time. When students were struggling with the material or were playing off-task (such as gossiping or talking to students in other classes), the microphone was not treated as part of their performative work. For example, during the second unit when Ashley and Justin Case were working together and were confused about their reading, Ashley asked "Isn't it creepy we're just being recorded? (transcript, Sept. 23, 2014). At other times when students were confused or disengaged they would begin whispering to each other or asking if they were still being recorded. Thus when the work became challenging to the point of frustration and disengagement, the microphone ceased being fun and became a burden.

When students were able to comprehend their work and were focused on it in a positive way, the recorder became part of their engaged play. Even in the above example of Ashley calling the recorder creepy, she and Justin Case were able to bring the discussion back to our class by wondering who might listen to this recording in the future and they pondered if future listeners would find it strange that gay marriage was ever illegal. This playful dialogue with the recorder as the center allowed them to circle back to their topic of Christian responses to gay marriage, and they mused about what it would be like to know Jesus as "just a person" (transcript, Sept. 23, 2014) and wondered about the future of religion. While at first it may seem their speculative play was completely off task, they were using it as a way to imagine a different world and how that would affect their topic. Without this playful moment, they may have remained stuck as they tried to understand their article about same-sex marriage and likely would

not have been able to continue their discussion. In this way, being playful was more productive than staying "on task" and only talking about the text.

Playing with Social Justice

Despite the fact that our course dealt with heavy issues, the students were at times able to be playful with the material. When we were brainstorming ways to present their final projects on same-sex marriage in a way that would relay the message to more people than just the school community, the students had a few ideas:

> Jimmy Smith: We could fly it [a banner] over a bunch of Republicans or something.
> Summer: Yes, that would be fun!
> [All talking at once- someone talks about dumping glitter]
> Summer: Did you know glitter bombing is actually a tactic that gay rights activists were using, to Republicans? A couple of years ago. Like Newt Gingrich got glitter bombed. Personally I hate glitter-
> Morgan: Yeah
> Summer: So I wouldn't want to do that.
> Student 1 [cannot tell which student on recording]: Glitter bombing!
> Student 2: Silly string! Attack them with silly string!
> Morgan: [to Summer] We could even set it up so some of them could do a video, some could do a poster presentation, depending on what they want to do. (transcript, Oct. 23, 2014)

The students were not only ready to share their thoughts on same-sex marriage and why it should be legal, but wanted to have fun as well. They wanted to target the Republicans who were vocally opposed to gay marriage, such as North Carolina's Thom Tillis who had declared he would keep fighting against gay marriage in our state even though the U.S. district court had negated N.C.'s Amendment One (gay marriage ban) and same-sex marriages had begun across the state (Associated Press, 2014). While I was enthusiastic to participate in their playful discussion on glitter bombing Republicans, Morgan continued talking with me in an "on task" way about options for the presentation. She is likely used to such playful antics as a middle school teacher and thus could ignore it to continue making class decisions.

Another example, which made me laugh out loud when I listened to it, was with Aiden and Jimmy Smith (fifth grade boys). This conversation took place as they were walking outside from the middle school building to the library's computer lab to edit their video on same-sex marriage. They wanted to figure out how to begin their video and make it interesting:

> Aiden: You have to sing-
> Jimmy Smith: [singing] 32 states, have legalized gay marriage! Gay marriage!
> Aiden: Yes it has to sound catchy.
> Jimmy Smith: We have a catch song, we totally have to have a catch song! I have to start- that can be the intro, like a catch theme song. And we can play it at the end too.
> Aiden: Um, what's a catchy song? Frozen. You have to sing it from Frozen. [Frozen is an animated Disney film that was current and extremely popular.]
> Jimmy Smith and Aiden: [singing] Let it go! Let it go! [*Let it Go* is a popular song from the film.]
> Jimmy Smith: Gay marriage is OK!
> [Laughing]
> Jimmy Smith: Let it go! Let it go! Let the law pass in all of the states!

Sadly, there was not enough time for the song to make it into their video, so I am glad it was captured from their conversation. By thinking of how to make their video "catchy," they were able to play around with the message. Similar to the podcast boys' discussion of how to present the information on their website, Aiden and Jimmy Smith were thinking (and playing) through ideas for relaying their message. This idea of conveying a message was important to them, and they knew it was necessary for their video. This conversation also shows that they were making connections between the content and pop culture and knew pop culture references can be used to catch an audience's attention. Further, this shows some mathematical reasoning. They were wondering what the proportion of pro-marriage equality states were needed for there to be a tipping point in favor of marriage equality nationwide, and thought that 32 pro-marriage equality states proved that there was great momentum. By pairing gay marriage with "let it go!" they were calling on the general public to let go of discriminatory practices and laws, and to let gay marriages happen nationwide.

Summary

As described here, processing in Math for a Cause relied heavily on dialogue, reflection, and engaged play. Allowing students to talk to each other, reflect on their feelings, and play with the material and the research process resulted in student learning. Listening to the audio recordings of student talk, I realized that the way the students were engaged in learning seemed queer as much of it was outside of the stereotypical, traditional teacher-led classroom. While I fretted about not doing enough to help their learning, I should have instead relaxed and noticed that the students' own process had taken over. The teachers were helpful in the process, as seen in some of the examples here, but even then the learning was largely generated from the students themselves. This phenomenon can be understood by once again looking to Luhmann (1998):

> What is at stake in this pedagogy is the deeply social or dialogic situation of subject formation, the processes of how we make ourselves through others. As an inquiry into those processes, my queer pedagogy is not very heroic…hopefully it encourages an ethical practice by studying the risks of normalization, the limits of its own practices, and im/possibilities of (subversive) teaching and learning. (pp. 153-154)

I certainly felt anything but heroic as I went through the course and worried about my own inadequacies as teacher researcher. However, I was able to develop a practice and pedagogy that studied the risks of normalization, which I learned included my own—and the students'—conceptions of what a class should look like. Through the social dialogues the students engaged in they learned how the subjects they studied in social justice texts were formed, as well as how they themselves were shaped. They thought about how they felt when they confronted a text and what this meant about how the information was presented. Through processing, *Math for a Cause* was enacted.

CHAPTER 6: WHAT DID PROCESSING CREATE? AN INTRODUCTION TO MAJOR THEMES IN *MATH FOR A CAUSE*

While the course unfolded and I collected and examined data, it felt chaotic. Everything seemed too messy and uncertain, and I constantly felt I was failing because of the messiness and uncertainty. However, when Bryan and I started interviewing students I saw that they were learning through all this messy processing, as described in the previous chapter. When data collection was complete and I had more perspective, themes became clear. Yet the following neat presentation of related themes does not mean there was neatness in execution. It was the very noise and chaos of the course that allowed these themes to appear. Indeed, if the class was as neatly executed as this chapter, it is likely none of this would have occurred.

From the students' processing, three major interlocking themes emerged: *recognizing the puzzle* (learning to see the world and their own knowledge in abstract ways and to ask 'why?'); *resisting the average* (learning that 'average'—whether this was a social norm or a mathematical average-- is not always best, and does not represent the full picture); and *abandoning closure* (learning that there is no one right answer or way of solving problems). The themes are not a hierarchy, as they each implicate the other. Recognizing the puzzle was the first one that I noticed during the study, and Bryan and I had several conversations where we marveled at the way students' minds had opened to abstraction. As such, I will discuss it first but the other themes are just as important, and the order of presentation is ultimately arbitrary.

All three themes are united in their relation to ambiguity, to learning that the world is not built from easy dichotomies of right and wrong. This knowledge is imperative to any social justice work. As Hytten (2008) discussed when describing her college education students, "they

were frustrated with ambiguity, impatient with the difficult work of uncovering assumptions and fundamental beliefs" (p. 186). Hytten suggested that "first, we should teach students to uncover, analyze, question and critique fundamental assumptions. Second, we should teach ways in which to productively deal with uncertainty. Third, we should help students to seek out and propose alternatives to the status quo" (p. 192). However, these suggestions differ from a queer pedagogy mindset in that queering teaching and curriculum does not necessarily "teach ways in which to productively deal with uncertainty" or *explicitly* "help students to seek out and propose alternatives." Instead, queer pedagogists such as DePalma (2010) suggest letting questions hang without resolving them. This fundamental difference revels in ambiguity, rather than using it as a place from which to create plans of action. The ambiguity *becomes* the action. Mayo (2007) also wrote of this comfort in uncertainty

> What draws queers and queer associations together is the understanding that connections are ambivalent and alliances to one another are structured by intermittency, gaps, and possibilities. Queer ethicality—to take the central concept from Anzaldúa's (1990) mestiza consciousness—is deeply involved in working through and living with ambiguity. (p. 185)

Our students dealt with ambiguity to varying degrees of comfort and productivity, but overall it seemed that this led to more sophisticated ideas about math, social justice, and their own learning.

In this introduction to the themes, I will illustrate how all three were often evident simultaneously in an example of processing. The example is from a whole-class conversation on Oct. 21, 2014 about the American prison system that features prominent math skills, as well as highlights a few of the focal students from the study. Morgan created a worksheet (see Appendix F) to allow students to practice calculating percentages while reflecting on what the prison populations in our country indicate about racial inequalities. While to the adults it was clear that the numbers indicated a flawed, racist system, the students struggled with this

realization. This example, occurring just past the mid-point of the trimester, was a turning point for the students as well as teachers. Our conversation caused Morgan and me to realize that the students had a long way to go, both in terms of basic math skills like calculating and interpreting percentages, but also in the ways they talked about race. Most prominently, it pointed to the need for visible diversity in classrooms, as the students barely knew any people of color and so were unsure if they should take the high number of people of color in prison as an indicator of something about the people or the system. I will present long excerpts of this conversation below to provide a detailed context for discussing how each theme can be found within this classroom moment.

Morgan: Number 3 asks what conclusions can you make from this math, OK, but this looks like a whole bunch of jumbled numbers. Can somebody kind of clean up what these numbers mean and how they're related to each other for us?...
Sum Dood: Well … more than half of our population is in prison. …
Morgan: How about the percentage of the world's population and prisoners…?
Sum Dood: Either we're real efficient and catch all the crime, or we're the same amount of efficient as other countries but we just have more crime, *or* we put a lot of people in jail without investigating enough.
Morgan: Hmm. So a number of different things. …
Sum Dood: But like we're 5% of the world [population]
Morgan: Mm hmm. But we're 25% of the prisoners… [The worksheet] says that 12.6 % [of the total U.S. population] are African American and 17% are Hispanic. What percent does this make up altogether?
Sum Dood: 29.6%
Morgan: 29% of the [total U.S.] population? So 58% of all the [U.S.] prisoners are African-American or Hispanic. … Is that alarming to anybody?
Justin Case: Yes
Morgan: Why, Justin?
Justin Case: Because … it's double the amount of percentage of people.
Morgan: …What other things did you guys think about when you saw this? Ashley?
Ashley: It wasn't exactly like, I feel like maybe the cops that, if they are racist they didn't think that people would go think about that kind of thing. I don't know, it just seems really out of proportion.
Morgan: What were you guys thinking when you saw these numbers?
Ally: Well the first thought that came to me wasn't just because they're bad people, because um it's like a really popular but bad thing that's happening in our country where black people are racist [she meant people are racist towards black people], so I, instead of thinking that they're all bad I start to feel bad for them.

Morgan: OK, so rather than going to the place of "oh wow, African Americans and Hispanics are bad people or all criminals" you were like that's not fair.
Ally: Yeah, racist people are just putting them in jail to prove their point or something….
Summer: Can you remember what you were thinking about or how you felt when you looked at [those questions]? And then [we] asked you to draw a conclusion from that?
Bryan: Was anybody confused by that statement? It's a pretty confusing statement I think.
Sum Dood: I was like, I kind of didn't want to believe that one. …It was hard to believe it was actually true that we can have that much prisoners.
Summer: Did anyone else think that? That you couldn't believe it?...
Ally: I thought you were lying at first.

As is evident from this partial view of our conversation, the students were engaging in heavy conversation about systemic racism, and wondering if police and judges were racist and "trying to prove their point." Using this example, I will address each analytical theme: recognizing the puzzle, resisting the average, and abandoning closure.

Recognizing the Puzzle

This theme can describe the entire passage, as the students were seeing that the percentages they calculated told a story of more than mere numbers. They were surprised, confused, and alarmed (as was I) to learn that the U.S. holds only 5% of the world's population but 25% of the world's prisoners. They were further surprised to learn that African-Americans and Hispanics (this word was used by Morgan, as the sites she got her data from used it instead of Latina/o) are overly represented in U.S. prisons. Though Rosette (sixth grade girl) admitted that the numbers caused her to initially think these groups commit more crimes than white people, she did ultimately question her impression. Perhaps through our class conversation, or by talking with her classmates earlier, she was open to the idea of more complicated possibilities.

The students were also asking why, directly in relation to the math. Justin Case (seventh grade boy) and Ashley (sixth grade girl) wanted to know why there were so many African-Americans and Hispanics in prison, as the numbers were disproportional. Ashley even suggested that if cops are racist, they do not expect people to notice the disparity, showing that she is

thinking of their motivation not only for unfairly charging people but perhaps why there is not more cover up for it. Finally, Sum Dood (sixth grade boy) and Ally admitted that when they were first confronted with these numbers, they did not want to believe the implications. But despite this discomfort, they were both able to work through this initial reaction and concluded that the numbers indicated something wrong with our prison system. For this class at least, we felt our social justice goals were met as the students were able to interpret the data in line with equity, rather than blaming African-Americans and Hispanics and casting them as criminals. As Ally acknowledged, "it's like a really popular but bad thing that's happening in our country" where people of color, predominately Black and Latina/o people, are unfairly painted as criminals. This conversation snippet revealed that recognizing the puzzle stimulates dialogue and problem solving, and vice versa.

Resisting the Average

The last example from Ally leads to our next theme, *resisting the average.* Ally knows that there is a false "popular" belief in the U.S. that Black people are bad. This is something we discussed in our first unit about Michael Brown. Ashley was also resisting the average perceptions of race in the U.S. when she voiced that the numbers were out of proportion. She also posited that the 'average' racist cop probably would not expect American citizens to investigate prison populations like we did in class. In both of these cases, Morgan's plan to use the worksheet to get the students to realize racial disparities exist in prison worked.

Another 'average' that comes up in this example is the expectation that students will believe in the institution of school. Meaning, that they will take what their teachers tell them as fact, and follow directions as given. As Ally and Sum Dood admitted, they could not believe what the numbers indicated at first. Ally even thought we were "lying," for surely such

disparities could not be real. This form of resistance showed up throughout the course, and it was sometimes a help and other times a hindrance to student learning, but resisting the average created a resistant tension that could have led to (premature) resolution. However, instead of assuming the adults were lying, Ally was able to see (by continuing to resist the average and recognize the puzzle) that average ways of thinking needed interrogation.

Abandoning Closure

Finally, through Sum Dood's positing of possible explanations for the large percentage of the world's prisoners in the U.S., we see that students are *abandoning closure.* Sum Dood offered three explanations for the high percentage: 1) we have more crime, 2) we are better at catching criminals, or 3) we put people in jail without proper investigation. Rather than lead students immediately to the third option, Morgan pointed out that we did not know for sure which of these were true. She was able to let the question hang in the center, such as DePalma (2010) suggested doing in queer pedagogy. While in the moment I found myself wanting her to give them the definitive answer that the system is racist, I am glad I did not step in, as the students did decide that was likely the best explanation through the discussion. However, no one was completely sure, and they were all willing to think about the issue from multiple angles.

Because of this, the students were asking lots of "why" questions: Why might we have more prisoners? Why might cops put more African Americans and Hispanics in jail than other races? Why do people believe in stereotypes? The students not only delved into the complexities of race in the U.S., but also reflected on their own thoughts and feelings on the topic. We did not push the conversation so far as to ask them how they are implicated by these systems of oppression, and Morgan assured them we were not asking them to go solve all these problems. Yet it was evident from their reactions that they were thinking about these issues in a nuanced way for the

first time. As Luhmann (1998) wrote, "subversiveness, rather than being an easily identifiable counter-knowledge, lies in the very moment of unintelligibility" (p. 147). By letting the students work through these foreign ideas, they were able to come to their own ideas that remained open to possibility.

This Oct. 21 class was a turning point. This is likely due in part to the mathematical tasks being presented in a more scaffolded and direct way, which allowed students to focus on the issues at hand rather than sorting through information to create a problem. In the following sections, each theme will be explicated in more depth. I will begin with *recognizing the puzzle* not to indicate its superiority, but because it was the first theme I noticed while still collecting data. *Resisting the average* and *abandoning closure* will follow. Some examples will be used for multiple themes, pointing out elements that resonate for a particular theme, which illustrates the interconnectedness between them.

CHAPTER 7: "THERE'S PROBABLY JUST MORE TO MATH THAN 5 PLUS 3 EQUALS 8": RECOGNIZING THE PUZZLE

As Bryan and I reflected on what we observed throughout the trimester, particularly after student interviews, we realized that something beyond what we had imagined was happening. Rather than merely gaining insight into what social justice meant, students' ideas about math as a concept were greatly expanding. They were also asking questions of themselves, the school, and public opinion at large. As Jimmy Smith, a fifth grader, said in his second interview "there's probably just more to math than 5 plus 3 equals 8" (personal communication, Nov. 12, 2014). He noted that in our class, he was "prov[ing] a point using math" rather than "just solving a math problem and saying 'yeah I got it right'" (personal communication, Nov. 12, 2014). This focus on "proving a point" gave a larger purpose to math, and through it students gained more complex understandings not only of math, but of the world that math describes. As Rosette wrote on her final reflection when asked "How do you feel about social justice?": "I think that some things are confusing, and that it's never going to be 'right' for everyone" (student work, Nov. 11, 2014).

The students were learning that social justice is not something that can be easily fixed, and instead were interrogating instances to understand the circumstances surrounding and causing them. O'Loughlin and Taylor (2014), in discussing non-normative conceptions of youth growth, stated:

> Critical possibilities for youth are expanded when institutions such as schooling and mass media are rendered less hegemonic…Such opportunities cannot occur on a grand scale, however, unless the hegemonic systems in place… are open to critical interrogation and change…A good starting point is with those children who, experiencing institutionalized systems as alienating and queer, rather than bowing down in conformity seek out points of rupture and possibility. (p. 48)

Our students were not necessarily experiencing their school as "alienating and queer;" as mentioned in the description of the school, it was remarkable how comfortable, safe, and happy the students seemed at this middle school. However, even in this relatively loose school environment as compared to typical public middle schools, our class did bend the hegemonic rank of teacher and student as the students had more control and responsibility over their own learning with less teacher-imposed structure and scaffolding. In this way, it was our classroom environment itself which became "alienating." At times students felt they wanted more help and structure, but it was this "queer," loosely-constructed aspect of the course that led to sophisticated musings on knowledge.

It was the recognition of complexity that led to the naming of this theme as *recognizing the puzzle*. Students' mental expansion was more than just broadening perceptions and bringing awareness to new ideas, and included enabling the students to see that the world is a puzzle that is nuanced and complex. This caused them to question their knowledge and push against boundaries. Here I am using puzzle more as a verb than a noun, in keeping with using queer as a verb rather than a noun. To puzzle or feel puzzled is to confront a difficult problem and challenge oneself mentally. A puzzle, the noun, does not necessarily need to be solved, but is something to ponder. It can be played with, to acknowledge the *processing* that brought students to this recognition. Recognizing the puzzle also caused them to start asking questions, primarily why questions, as they considered social justice issues, the math they found through their research, and the problems they created to try to shed light on the topics.

Recognizing the Puzzle as Queer

During this study, I was constantly worrying if my work was truly queering pedagogy or if we were simply perpetuating the status quo. This excerpt from my field notes illustrates this process, which was part of my own beginning to recognize the puzzle that is queer pedagogy:

> The queering is not just an examination of their ignorance, but also the boundaries I had (through my research questions so closely aligned to the literature) of the study. Having them conceptualize of math in a new way, not just of social justice or its uses, was something beyond our expectations that opens up a lot of possibility for growth and change. I was so focused on seeing if their work matched the criteria of critical literacy and critical math that I may have missed this other phenomenon that doesn't fit into those narrowly-defined categories, had we not asked the students to reflect on their own experience. (field notes and reflections, Nov. 14, 2014)

Questioning is a foundational piece of queer pedagogy. Luhmann (1998) stated that queer pedagogy is best thought of as a question rather than a technique, and further explained:

> The shift [to queer pedagogy] is one of pedagogic curiosity, from what (and how) the author writes or the teacher teaches, to what the student understands, or what the reader reads. Accordingly, pedagogy then begins to shift from transmission strategies to an inquiry into the conditions for understanding, or refusing, knowledge... (p. 148)

This curiosity was evident as students questioned what math was and what it could do, as well as questioning social norms and learning that they were connected in complex ways. For myself, Bryan, and Morgan, we wanted the students to learn and come up with problems in a generative way (inquiry) rather than us directly lecturing or instructing (transmissions strategies). As Mia reflected on her end of class survey on her feelings about math, "I feel like I'll always be trying to understand it" (student work, Nov. 11, 2014).

This constant questioning and searching relates to Britzman's (2012) discussion of reading practices in queer pedagogy, where "how one reads the world… [can create] a queer space where old certainties made no sense" (p. 297). One of these "old certainties" was the idea that math is a separate subject devoid of context, and many students said in interviews or wrote in their reflections that they enjoyed having a math class combined with social justice. As

Krywanczyk (2007) said on the subject, queer pedagogy can differ from single-issue pedagogies as it "radically recognizes inequalities [as] complex …while simultaneously challenging the foundations of categorical distinctions" (p. 32). As discussed in Chapter 6, when students examined percentages relating to the U.S. prison system their ideas of the police and racial stereotypes were challenged, which broadened their perceptions of these topics. Furthermore, as Winans (2006) wrote, queer pedagogy questions "how knowledge is created, authorized, and normalized" (p. 107) from a local perspective. When we considered social issues that were important to the students, such as marriage equality, students began to see how numbers and social stereotypes can be used to manipulate public opinion.

This chapter will first discuss moments students began to recognize the puzzle, and then times when Bryan, Morgan or I did as well. Each of these participant sections will be broken down further into sub-themes.

Students Recognizing the Puzzle

Broadening Perceptions

This sub-theme was first noticed during data collection as Bryan and I interviewed students and they told us how their feelings on math and social justice had started to change. By the time we got to our final interviews, this difference was profound. Sum Dood, in his first interview on Sept. 30, said,

> In this [class] you have an idea of what … you're making a problem about, … and then you set it up like you pretty much start from scratch except maybe like a topic. Whereas in like a regular math class you use a book and just do the problem.

This shows that he was seeing math as beyond "just doing the problem" and saw the possibility for inquiry. When we interviewed him again on Nov. 14, his thoughts on math had gone further towards abstraction:

> I thought oh math is like helpful to do like some science and measuring stuff but I didn't think math can show there are problems with this or something. That like, this is a problem… I think I like it the same amount, I just know more. I think of math as a bigger thing now. Before I thought of it as like small …just numbers, and equations.

Seeing "math as a bigger thing" shows that Sum Dood was recognizing the puzzle that math is a part of, rather than seeing math as "just numbers" separate from social contexts. When he said he "knows more" about math, he means he now knows it can be used to "show" there are social problems, it can demonstrate an idea as well as a numerical answer. In Mia's (seventh grade girl) final reflection, she described math as a "puzzle"; Jimmy (fifth grade boy) described it as "endless." The students had all come a long way from thinking of math solely as worksheets and textbooks. Morgan was also encouraging the students to think of an expanded use of math, when during the final project she asked students to share their findings from their final project outside of the school by asking them to "think of a way you can make an impact or reach more people" (transcript, Oct. 28, 2014).

Asking Why

Another major part of this theme is asking why. This began to surface early on in the semester when we discussed the shooting of Michael Brown. Aiden (fifth grade boy) spoke with me for several minutes at the end of class on Sept. 11, postulating on why Darren Wilson (a police officer) shot Brown multiple times and killed him. He thought if the cop had to shoot him, why not shoot him in the leg to wound him and make him stop walking? Or why not use a Taser or a baton? (field notes, Sept. 11, 2014). While his speculation on this day did not include speculation of the necessity of shooting or wounding Brown at all, he was trying to gain a more nuanced understanding of the case. Ally and Ashley also engaged in conversation with me on Sept. 18. We talked about how if a girl was seen dressed in baggy pants and a sweatshirt, she might be judged differently than a male in the same outfit. I also asked them to consider gender

and gender expression in relation to race (transcript and field notes, Sept. 18, 2014). With another group, I asked them to consider what may have happened if Michael Brown had been a woman, and they thought a woman was less likely to be shot by the police, but that a black woman was more likely to be a victim than a white woman (transcript, Sept. 16, 2014). Discussing these intersections of race and gender allowed me to introduce the concept of intersectionality, without naming it as such for the students, and allowed a recognition of the nuanced puzzle of human experience.

Sum Dood illuminated this theme in his first interview: "Well, first I think it's important to understand why, like before you try and solve the problem, understand why that problem is there" (personal communication, Sept. 30, 2014). Sum Dood was talking about investigating why opponents to same-sex marriage felt such opposition to something that, to him, was an issue that warranted complete support. By reading different viewpoints in our class, he was questioning what "old certainties made no sense" (Britzman, 2012, p. 297) in regards to both his own certainties on why supporting same-sex marriage was good, and why opponents to same-sex marriage thought it was bad. He was seeing that the puzzle of the social milieu included his own beliefs as well as others, and wanted to think about why and how each side had formed their opinion. As will be discussed in the *abandoning closure* section, this questioning of opinion was not something students were encouraged to engage in at school.

Teachers Recognizing the Puzzle

Broadening Perceptions

As previously stated, my and Bryan's expectations were also blown apart through the course. Our enthusiasm for Mia's conceptual growth was great, and through her we began to see that even if our students did not gain much in the form of concrete math skills, this broadening of

perceptions was perhaps a larger gain. We realized that our math goals had been very normative: skill based. This goal was queered as the students showed us that learning skills was perhaps not what we should have been expecting as students learned to connect math with social justice. In Frankenstein's (2005) discussion on developing criticalmathematical (spacing in the original) literacy in her classroom, she outlined four goals: "1. Understanding the mathematics. 2. Understanding the mathematics of political knowledge. 3. Understanding the politics of mathematical knowledge. 4. Understanding the politics of knowledge" (p. 19). It is logical to state the goals in this progression, and seems natural that an understanding of the basic math concepts is necessary before moving on to political knowledge. As I wrote in an analytical memo, the students cannot have a queered understanding without a basic understanding (Oct. 14, 2014). However, looking at the data from *Math for a Cause*, it is evident that the goals do not necessarily progress in a linear fashion. There were many times students struggled with calculating percentages, but were moving towards Frankenstein's (2005) last two goals. Even as they struggled with the mathematical skills, they sometimes knew enough to question "the politics of knowledge," such as when we discussed the prison system, or a group researched healthcare for transgender people in the U.S. while conducting flawed calculations.

I also had to broaden my perceptions of Morgan and what she expected from the class. During our interview after the course was completed, we discussed her expectations:

> Summer: I remember when we first started you were hoping they'd come out of this … able to say this percentage of … this group is discriminated against for whatever. And that totally didn't happen, so I hope you're not disappointed by that.
>
> Morgan: No no no, I don't even remember what I said at the beginning. No, I think I was just hoping, you know, I always love opportunities to help them see math in real life, and … we were trying to push them to see it not just doing problems and getting the right answers... (personal communication, Nov. 18, 2014)

While I was delighted that the children's perspectives were growing and changing, I had not allowed this same change and flexibility in Morgan. Based on an off-hand comment she made to

me early in the trimester, I had been needlessly worrying about how she was perceiving the class. I could have saved myself this worry if I had not put her in the fixed position of 'teacher' and allowed for her own expansion.

Asking Why

Morgan also began to question why throughout our course, primarily around the question of why the students had such difficulty talking about race but they did not have that difficulty talking about LGBTQ issues. This is something she was noticing already, but our class made the issue more evident as students struggled in our discussions about Michael Brown. As she told me in an interview:

> We just haven't talked about race here [at The Anchor School]. I mean, not in the way that we were hoping to talk about it [in Math for a Cause]. I mean we've talked about slavery, we talked about the Civil Rights Movement. But that's, that almost feels completely different. It gives a context and a history to what's happening today but, but the kids, they don't make that connection. (personal communication, Nov. 18, 2014)

This discussion helped me answer the question I had been wondering about- why in a school that seems liberal and progressive is race a hard issue to talk about? I thought it must be more than the fact that there are so few people of color, though that is certainly part of it. If the students only learned about African-American experiences in a historical context, and they were never asked to think critically about how those experiences have an effect on people today, it makes sense that they were stuck on figuring out simply if the people in prison were "bad" or not, rather than thinking about the systemic implications of racism. Morgan explained this when she said, in reference to our class on Oct. 21,

> When they're so not used to [talking about race] and so not ready we just really can't force it on them. And we were jumping right into, 'why are there more black people in prison', you know? That's heavy stuff. So, that's what I'm talking about with this identity class. So now that I have that experience behind me, you know as soon as we were done with that activity I was like OK wow, we probably should have done this differently. But … with this identity class, now I can really scaffold it a little bit more. (personal communication, Nov. 18, 2014)

This moment in class caused all of us to reflect on our pedagogy and our expectations for our students. It made the puzzle of our students' learning a little clearer, as we realized they had no experience doing the kind of critical reflection and analysis we were asking of them.

Teaching about the T in LGBTQ

At times, I, Bryan, or Morgan would intervene to intentionally get students to consider the complexity of a situation, to push them towards recognizing the puzzle. A few specific examples of this involved learning about transgender identities. While the school had an active GSA (gay-straight alliance) and frequently talked about gay rights, most of that discussion was centered on school issues for LGBQ students and same-sex marriage. These particular issues were important in their local community, as another local middle school's GSA had to fight their principal for recognition and same-sex marriage had been banned in our state the year prior, and then became legal during our course[9]. Marriage equality was a cause for celebration at The Anchor School, which was great to see at any middle school but particularly one in the South. There were several students whose parents were in same-sex partnerships, and other students who identified as LGB, so these identities were known and respected in the school community. However, due to these factors, there were other topics the students did not know much about, such as issues effecting transgender people.

During our second unit, the group who was interested in healthcare ended up focusing on transgender people. This led to many questions, which I was happy to engage with. Some group members had a difficult time understanding how and why transgender people could be discriminated against. I facilitated a discussion about this, and group members were able to think of several overt and covert ways doctors might discriminate against transgender people: by

[9] On Oct. 6, 2014 the Supreme Court denied a review of the 4th Circuit Court's decision in *Bostic v. Schaefer,* making same-sex marriage legal in Maryland, North Carolina, Virginia, South Carolina, and West Virginia.

refusing to take an appointment, making excuses or delaying appointments, or claiming they could not treat transgender people because they do not understand them. While the group members were in agreement that such treatment was wrong, some were still confused as to how it could happen in the first place (field notes and transcripts, Oct. 7, 2014). I think this confusion stemmed in part from being in an environment where intolerance of gender differences was not permissible, and so one student simply could not fathom that anyone would discriminate against trans* people.

In their world at The Anchor School, students are taught to treat everyone with kindness. It is also a largely white, cisgender, upper-middle class environment and so most students had never experienced discrimination. It was inconceivable to them that someone might purposefully choose to discriminate. In an environment where everyone's "uniqueness" is "respected and valued" (The Anchor School mission statement), how were they to understand that not everyone holds this belief? Or that they may hold this belief for some people, but not others? These complexities of human relations were not something they had ever thought about before, as it had not touched their lives personally. After our discussion, some were still confused- this was not a discussion that led to a simple resolution. However, I hope that it planted a seed so that they will start to see the world in more nuanced ways.

Another example comes from our last unit when we decided to focus on same-sex marriage for due to our state's recent legal changes. We had a broader class discussion about anti-discrimination laws and what job discrimination might look like for queer people. During this discussion:

> Sum Dood asked what do trans* people have on their licenses, and I explained that it was their legal sex, but if you have a gender affirming surgery (sex change) then you can

> bring a note from your doctor and get it changed[10]. But if you're in the middle, or don't want to specify, that's not an option. I'm glad that they're thinking of these things. I also explained how some people may not want to change it, and used the example of a trans* man still needing "female" medical care, and needing their license to say F so that it would be covered. I also said I've heard of people just getting a new license and checking the different box and that going through, and how maybe sometimes it depends on who you see at the office and how carefully they're checking everything. I'm always glad when I get to discuss these things as they come up, and am glad they ask these questions. (field note, Oct. 28, 2014)

While in my field notes I noted my excitement that we were able to have this discussion, looking back I hope that my doing most of the talking was not a hindrance, as this did not give them much opportunity to process the information with each other.

I continued to intentionally push their boundaries in the way I designed the demographics form (see Appendix G). I included a question asking what their legal sex is (male or female) and an additional question about their gender identity. As I had intended, this caused a lot of questions from the students. I explained that for some people, the sex you are assigned at birth by a doctor might not match with the way you feel. As we had talked some about transgender identities in the past, the students seemed to accept this answer. As DePalma (2010) and other queer pedagogists have noted, oftentimes queering takes place in small, daily moments of the classroom. This aligns with what Urrieta (2009) discussed as activism in the mundane activities of teaching. I am not sure if this direct approach is as powerful as the generative approach of the rest of the course, but I do think sometimes directness is helpful, especially when introducing new ideas.

[10] The doctor's note must actually be used to change your sex on your birth certificate. This can then be used as proof of identification at the Department of Motor Vehicles (DMV) to get a driver's license. If there has been a name change, that must also be legally changed before using the new name on the license. See NC statute Amendment of birth and death certificates.§ 130A-118.

Summary

Recognizing the puzzle was the first noticeable analytical theme during the study. When Bryan and I interviewed Sum Dood, Ally, Mia, and Jimmy Smith we were delighted by their discussions about the abstract nature of math and social justice. One facet of this theme was broadening perceptions. Students began to see math as more than worksheets and solving problems. In the interviews, and in student responses on their post-class survey, they spoke of social justice as something that was not easily defined. Along with broadened perceptions, students were also asking why. They wanted to know why they were taught that diversity and inclusion were important, and why other groups disagreed. Both of these sub-themes were found in my own work through the study, as well as in my conversations with Bryan and Morgan. Recognizing the puzzle relates to queer theorists' and pedagogists' desire to ask questions (Luhmann, 1998) and disrupt normative boundaries to queer the way we view the world (Britzman, 1995a). It was also the theme of recognizing the puzzle that let me see that despite the fact that the course felt like a disastrous mess in the beginning, good was coming out of it. However, it took me awhile to embrace that the mess is what caused the good results, instead of feeling that the good results were happening in spite of the mess.

CHAPTER 8: "MAYBE THERE'S MORE": RESISTING THE AVERAGE

The naming of this theme comes from Ally (seventh grade girl), a student who loved rules, structure, and boxes to shape her world into neat rows. Throughout the course her love of structure made things difficult for her, as our pedagogy was wildly different from other math courses she had encountered. She was frustrated by the lack of a linear structure, and seemed to long for us to tell her exactly what to do. It was her mother who expressed concerns to Morgan mid-way through the trimester that the class was too difficult and that the students needed more structure. Morgan told Bryan and me that this was something she struggled with socially as well, so it seemed that this need was engrained in her. So although Ally always participated in class, we did not expect her to have much conceptual growth as she kept a tight grip on her love of structure.

Yet when we spoke with Ally at the end of the course, and when I analyzed her interview, I was struck by the conceptual leaps she had made in the way she thinks about numbers, particularly averages. In the earlier weeks of our course, I was surprised to see that one of the most common mathematical skills students were using was calculating averages. Many times, this averaging was not appropriate for the task and told them nothing useful. Other times, they were trying to average things that cannot be averaged, such as percentages of opinions from different polls or different polling questions. Some of this focus was likely because calculating an average is something that is fairly simple for students of this age range to successfully complete. Maybe it was also because reports of averages are common in news stories, whether that is average income, average percentage of people who think a certain way, average time

spent on an activity, or the like. But I could not help but wonder if this incessant need to find an average could be linked to a worldview that values seeing average behavior as normal. Was there something more behind their constant search for the average than mathematical ease?

Looking to The Anchor School's mission, one of their core values is simplicity. I posit that this may be a factor in their reliance on the average. The description of this value includes complicated ideas such as utilizing one's own creative resource, and an "appreciation of the truth that the simple is often very complex." However, these nuanced ideas of simplicity are couched with other phrases that seem to contradict this, such as a "commitment to create a community/learning structure that is sensible and devoid of structural trivia." What is meant by "sensible?" This could be a call to an average way of thinking about learning and another aspect of their belief in a singular truth, which will be discussed in the next chapter on abandoning closure. Though the average way of thinking at The Anchor School may be different from a typical public school, the average mindset was still a strong force, and was described by Ally as being pushed on the students by the staff.

In this chapter, I will explore moments where students resisted a look for and belief in the average. I define *resisting the average* as realizing that 'the average' is not the only way of being, doing, or believing. The average took multiple meanings throughout the study, primarily in the form of norms and expected behaviors and actions, though it also included mathematical averages. At times the average was a kind of sameness; a denial of difference. These averages, norms, and expectations came from both society at large and The Anchor School's tight-knit community. For myself, the average took the form of expectations I held for teachers and researchers which I used to judge (often unfairly) Morgan and myself. As Ally said in her post-course interview, "maybe there's more to the average" (Nov. 12, 2014). When students,

particularly someone who liked clear distinctions as much as Ally, see the possibility for moving beyond an average their way of thinking can shift and become more open to multiple possibilities of seeing and being in the world.

Resisting the Average as Queer

More so than the other themes explored in this dissertation, *resisting the average* has close ties to existing literature on queer pedagogy and queer theory. Resisting sameness and normalization is one of the core beliefs of queer projects (for examples, see Britzman, 1995a; Goldstein, Russell, & Daley, 2007; Luhmann, 1998; Weems, 2007). As Ruffolo (2007) noted, queer theory "is committed to disturbing, disrupting, and decentering normative discourse that excludes in its attempts to include" (p. 255). For queer theory, the largest norm that needs breaking down is heteronormativity. This was troubled in our class at some points, but other normative constructions such as race, math class, and school values were more prominent.

I have chosen to use the term "average" rather than "sameness" or "normalization" because it is more specific to this particular project. Most obviously, average relates directly to a mathematical concept that is commonly cited in the types of news articles the students were reading. The average belief system at The Anchor School was not necessarily normative for the broader community, so the concept of norm itself is complicated by the school's unique position as a relatively progressive institution, in a relatively progressive region of a conservative state. The average way of thinking at The Anchor School was that the gay rights movement is celebrated, while in the larger regional context that is not normally the case. Furthermore, while the school claims to celebrate diversity, the average student is not diverse. All students are taught to think a certain way that aligns to the school's foundational Quaker value system.

Again, this belief system and racial homogeneity is not normal for most schools in the surrounding area.

Students Resisting the Average

Ally's Transformation

As Ally is the lead for this theme, I will start with an excerpt from her final interview on November 12, 2014. Italics are used for emphasis.

> Bryan: What sort of math skills do you think are necessary in order to do the kinds of things that we do in this class?
> Ally: Well I think percentages, those are really good, and averages. Those are really the main things, and we worked on those so that's good. That's like all me and my group worked with. We didn't get very far, but that's what we saw on the internet. The average of this, the percentage of this, blah blah blah blah blah. *It wasn't like actual numbers, it was just those. The average.*
> Summer: What do you think, like what do those percentages and averages tell you or allow you to tell other people?
> Ally: Like, like what?
> Summer: Like … if you see an average of one of these issues what does that tell you, or if you're finding an average what do you want people to know.
> Ally: Well let's just say- I'm making this up- … one school there are five kids who are 14, two kids who are three, and four kids who are nine. If it says the average is, something way different or something, *the average may not be what it seems*- there might be older people. I'm making this up cause I'm not doing the math- the average is like five, what about the 14 year olds? It doesn't say it there. *There's more to the average.*
> Bryan: So there may not be any five year olds, right?
> Ally: Yeah, but there are other people.
> Bryan: So what does that- what does that mean in terms of the work we did?
> Ally: I can't explain it cause I'm not very good at explaining, but I tried to use that as an example. *Some of the averages were different from other averages for the same thing*, but sorry this is sort of hard to explain. Like, on one website, the average would be higher and on another site the average would be lower or something like that. But it would have the same, it was really weird.
> Summer: Like there would be an average about the same issue or question but they wouldn't be the same number?
> Ally: Yeah.
> Bryan: Makes you wonder
> Ally: Like *are they lying, or are they giving their opinion of the average*?

There is much to unpack in this excerpt, but for me the most interesting thing is that Ally was realizing that the "average" was not necessarily "true," and so she was beginning to resist

the idea of the average as a way of representing the world. Again, for a student like Ally who likes rules, this was a large transformation in mindset. By comparing averages to each other, rather than just taking one at face value, she saw that there could be small differences between them. She saw these as so different that they became not "actual numbers" but something else. This awareness of complexity, and resistance of the average, is seen when she said "the average may not be what it seems" and "there's more to the average." Ally was starting to "take up that queer space of simultaneously questioning and asserting representations and in outing the unthought of normalcy" (Britzman, 2012, p. 294). Whereas before she accepted the average as a "number," which in her worldview meant something true, now she was questioning that truth and learning that averages can show difference instead of sameness. While she did not go so far as to question the validity of a number itself, this questioning of averages was a huge step in her conceptual abilities. In the following subsections, I will discuss other instances where students resisted average ways of thinking, doing, or being whether that was regarding school and our class, social ideas, or the research process.

From Averaging to Comparing

In the second unit, Ally, Rosette (sixth grade girl), and Mia (seventh grade girl) were investigating funding for education (transcripts and field notes from Oct. 2 and 7, 2014). They were looking at a complicated chart (found by me) that showed how much funding each state used for education (Baker, Sciarra, & Farrie, 2014) and were comparing it to another website that showed which states had the highest and lowest student-teacher ratios (NEA Research, 2014). While Mia and Rosette were excited about the website, and Mia was pointing out subtleties such as the distinctions between rates of funding versus poverty, they were having a difficult time synthesizing the information. Ally wanted to average the percentages on the NEA website for

student-teacher ratios, and thought that would tell them the average funding. Of course, this is not what that calculation told them, so there was some confusion about what an average does and when it is useful. Eventually, Mia realized "the average isn't really an average" (transcript, Oct. 2, 2014), and when Morgan stopped by their group she confirmed Mia's suspicion that calculating the average was not helpful and discussed with them other possibilities to find out which states' schools were better for students. However, they had spent so much time working on this and sifting through the complex information that during the next class Morgan ended up walking them through a math problem and doing most of the work herself.

This kind of mathematical miscalculation was evident in other groups. However, after several class discussions and individual conversations with groups about finding something to *compare* rather than finding something merely to *average*, their ideas about math problems changed. In the last unit on marriage equality, Ally was in a group with Rosette and Ashley. Again they looked for an average, but this time it had a purpose. They were looking at polling data on same-sex marriage (Same-sex marriage, gay rights, 2015), and calculating the average increase in support of same-sex marriage per poll. Here, their averaging had a clear purpose and illustrated how public opinion had changed over time. This difference how they created their math problem indicated growth in student understanding, both for what an average actually is, and how it can be used to illustrate a point.

Resisting Class Averages

Some of the resistance towards averages from students was directed towards the class expectations rather than math itself. A prime example of this was when Sue Denim (sixth grade boy) and Aiden (fifth grade boy) worked together during the second unit. They had chosen the environment as their overall topic, but were struggling to connect it to social justice.

Furthermore, they were completely resistant to conducting research and following directions. They chose to focus on turtles, and Sue Denim told Bryan, Morgan, and I that he already knew everything about them and so did not need to do any research. While we tried refocusing him several times, and reminded him that the point was to connect turtles to people somehow, he remained resistant to our plan. We had wrongfully assumed that he, keeping in line with the idea of an average student, would buy into our agenda and plan.

While student resistance is not uncommon in classrooms, in this class most of the students were accepting the parameters we gave them, and the general parameters provided by schooling in general. Sue Denim and Aiden were resisting both the power of the institution, and my own power as researcher-instructor. This is possibly a result of queering the curriculum. By giving the students more free-reign over their learning than is typical, there is the opportunity for students to use their power to derail the intended lesson completely. I had wrongly assumed that only people working under what I deem 'conservative' mindsets use research to prove what they already know, rather than looking for new information. It had never occurred to me that this could take place in a class on social justice in an environment like The Anchor School. So not only was Sue Denim challenging the average expectations for the class, but he was causing me to question my own expectations mired in average behavior. This hearkens to Britzman's (2012) question: "can pedagogy admit to the unthinkability of normalcy and how normalcy is being constituted again and again?" (p. 298). I was relying on the normalcy of school to do some of the work for me, without thinking of how this expectation was reconstituting normalcy, despite my efforts to create a different and queer pedagogy. As Ally stated, there is more to the average, and averages can disguise nuance and variance.

Resisting School Averages

School norms were also questioned by the students, particularly how the school imposed their worldview. When we asked Ally if she thought The Anchor School practiced social justice, she said:

> I feel like whenever they talk about it [social justice issues] they try to make it in your head that it's fine, and they're not different than us. And so, I feel like they're trying to change our opinions, that's a good thing in this way, but I feel like they're trying too hard. (personal communication, Nov. 12, 2014)

This was interesting to us, because it verified a feeling Bryan had shared with me that the students at The Anchor School were still following what "the cool kids" were doing, but that this behavior looked different from typical cool kids' behavior. As Danesi (2014) wrote in his examination of "cool" in youth culture, cool originally indicated "social rebellion" (p. 45), but this is no longer the case, as "it is now simply a way of describing appearance and socioability" (p. 45). This fits the environment of The Anchor School in which cool, though different perhaps from other school spaces, was not rebellious. They were not actively working against the status quo of the school staff or the outside world. This sentiment of cool as sociability was echoed by Sum Dood, who suggested that some people are racist because they think it is cool and are merely following the crowd, not because they are consciously against people of another race (personal communication, Nov. 12, 2014).

Because Ally was such a concrete thinker, she recognized that the staff wanted all the students to think a certain way. She explained that the staff talk about change within individuals, so that any talk dealing with a social justice topic like LGBTQ people is discussed on an individual, rather than a group, basis. For example, she said they were told "if somebody was not gay when they were younger but then in high school they change, then like you shouldn't be mad at them or anything" (interview, Nov. 12 2014). As we had seen from other conversations,

what could potentially be a conversation about social justice and systemic problems of racism, homophobia, etc., was reduced to a discussion about people in their immediate lives as opposed to the effects of broader systems of oppression.

Similar ideas came out in Sum Dood's interview. When asked in his first interview if his ideas on social justice had changed, he said,

> Sum Dood: I think partly it [the class] made me more trying to understand why the people who don't like gay marriage, just going with gay marriage cause that's what we're doing, why people don't like gay marriage don't like it…, cause I used to like, whenever I did this kind of thing, I'd look for more why they *should*. And now I'm trying to look at the other side.
> Summer: So now you're trying to look at what their motivation is for having that opinion.
> Sum Dood: Yeah, for why that is.
> Bryan: Why is that important to you?
> Sum Dood: Well, first I think it's important to understand why, like before you try and solve the problem, understand why that problem is there. (personal communication, September 30, 2014)

Here, Sum Dood is realizing that at their school, mostly everyone believes that gay people should be allowed to get married. He recognizes that one of the tactics to convince people to support same-sex marriage is "cause that's what we're doing," without engaging in any critical reflection on the topic. This class caused him to look at "the other side" and consider *why* large groups of people think differently. This allowed him to resist the average mindset of the school in a productive way that would give him stronger, more thoughtful responses to opponents of marriage equality. This example also shows how the queer themes found through this study are interconnected, as his resisting the average here is directly tied to *recognizing the puzzle* as he is beginning to ask why.

Resisting Average Opinions on Race

Throughout the course, students used their critical literacy and critical math skills to resist average depictions and conceptions of people, including on issues of race. Although race was difficult for the students to talk about, they did have an awareness of the way the media and

society portray people of color as lesser than white people. In the first unit on Michael Brown, Bryan asked the students in a whole-class discussion to notice how Brown was addressed in the articles they read. One group, who read an editorial from a conservative author (Chavez, 2014), immediately identified this author as racist because she kept emphasizing Brown's large size, and wrote that calling him a teen made him seem like a child when he was actually an adult. Another group said he was referred to as Mr. Brown in their article (Bosman & Fitzsimmons, 2014), which also showed him as an adult, but they were not sure if this meant the authors were racist or not. We were impressed that they were able to quickly understand the differences between the articles based on this alone. These examples show that students were resisting the average response expected for readers of these news articles.

Many examples of resisting average societal views of race occurred during small group discussion. During the same unit on Michael Brown, Sue Denim and Sum Dood chastised Justin Case for saying, "Ok I was gonna make a really racist joke..." (transcript, Sept. 16, 2014). Sue Denim said "What the heck dude, why?... That's not even funny." When Justin Case proclaimed "I was kidding, I wasn't actually going to do it" they repeated that his statement was not funny, and shut down the conversation. In some spaces in broader community surrounding The Anchor School's, it would have been acceptable for a white person to make a racist joke. In this case, even stating that you were thinking about making such a joke, not even saying it aloud, was cause for censure. While Sue Denim and Sum Dood were resisting average societal norms, it can also be argued they were supporting average ideas in their school community.

In another small-group session during the same unit, Ally and Ashley wanted to talk about race with me. They discussed the societal stereotype that black males in hooded sweatshirts are seen as dangerous, and consequently wondered how Michael Brown was dressed and if this was

a factor in his death. Another example of critically examining race came from Izzie during the second unit, when her group was examining healthcare. While examining a source that illustrated differences in healthcare in the U.S. according to race she noticed that Hispanic was defined as someone who spoke Spanish as their first or second language. She questioned if that was a realistic way to define this group. Students were questioning how racial categories are defined as well as what effects racial stereotypes have on people of color.

Resisting Average Opinions on Queer People

Another form of resistance against the average was through students' analysis of the opposition to same-sex marriage. As discussed previously, students at the school generally supported gay rights and marriage equality. In our class, Ashley, Justin Case, and Sum Dood were looking at opinions from the opposing side for the first time. They read an article on Christian arguments against same-sex marriage (Gobry, 2014), and Sum Dood proclaimed,

> It gets me really fired up about like, just like they, I can understand if they said they weren't like, 'I will never be gay' or something, they will never be gay, but I don't see why they, I don't see why they make it that *everybody* can't be gay. (transcript, Sept. 25, 2014).

Sum Dood and his group mates were confused as to why Christians (the students had not yet distinguished between Christians at this point) wanted everyone to be the same (or the average): not gay. They recognized that the "norm" for Christians was straight, and that they wanted everyone to fit this norm. Without naming it as such, the students were reacting against heteronormativity and compulsory heterosexuality.

In Sum Dood's final interview he discussed this unit more and mentioned that he, Justin Case, and Ashley had submitted comments to another article posted on an extremely conservative Christian website (TFP Student Action, n.d.), but these comments were not approved by the moderator and so never appeared on the site. As Sum Dood pointed out when discussing the comments that had been approved,

> There was no really pro-gay. There was one that was kind of like, …'I don't think you should care' or something. But nobody, there were no comments that were like, 'you people shouldn't be fighting against gays' or something…Or, 'gay is good.' That person was just like [in a flat voice] 'It's fine. It's no different from regular marriage.' (personal communication, Nov. 12, 2014).

Here Sum Dood recognizes that even the 'supportive' comments are still averaging out marriage as the same experience. The commenter was not actively fighting for gay marriage because it is the right thing to do, but because same-sex married couples are the same as straight married couples. This point of flattening differences has been made by queer activists who want to fight against this sameness, this normalization of queer relationships (Conrad, 2010). While Sum Dood is not making arguments as critical and radical as those in Conrad's volume (2010), which discusses problems with marriage as a legal construct, I find his revelation highly sophisticated, especially for a sixth grader who is new to the concept of social justice.

Resisting Average Behaviors in the Research Process

The most surprising, and often delightful, resistances to average ways of being involved the research process itself. As discussed in the processing chapter the students were very playful with the recorders. I gave them full control, showing them how to turn them on and off, and told them I wanted to listen to their working processes to help plan our class. Rather than ignoring the recorders as adults often do, they used them as a chance to play and perform. As discussed in Chapter 5, Justin Case, Sue Denim, and Sum Dood immediately began performing a podcast for an imaginary audience. They made sound effects, had fake advertisements, and "out-tro" music to finish the show.

> Ally, Rosette, and Ashley took a different approach and treated the microphone as if they were reporters. In the beginning, they turned the recorder on and off frequently, and began by introducing themselves and their topic:
> Ally: This is Ally
> Ashley: This is Ashley
> Rosette: And this is Rosette
> Ally: And we are doing the article about Michael Brown and…

Ashley: The Anonymous Operation Ferguson Press release. (transcript, Sept. 16)

They would also talk about their process directly: "Ally: So we are logging in to research this article and answer the questions on this sheet of paper. Rosette: And trying to find a math problem" (transcript, Sept. 16). These students were some of the only ones who talked directly to me on the recording, saying "sorry Summer" if they were getting off task. Once when Mia was left alone by her group she told jokes to herself and asked "who am I even talking to?" (transcript, Sept. 23). In these interactions, the microphone took on a personality of its own as constructed by the students and it became a part of their work.

Student-chosen pseudonyms were also tied to their use of the microphones, as the students often used their pseudonyms while on the recording. Ashley, Sum Dood, and Justin Case even used them when they attempted to write comments on a news article. As we had instructed them never to use identifying information when replying to public articles, they naturally used the fake identities with which they were already playing. The 'podcast boys' also used their pseudonyms on their final project website. The pseudonyms thus became a part of their performed identity for the recorder and their imagined audiences.

This false identity was even embodied during the last day of class as we filled out demographic forms, a process some students queered. Sum Dood asked me if he had to write his real age and grade on the form: he wanted to be older, and in a higher grade. Several students seemed to think it was silly that they had to have a fake name but all the other demographic information had to be real. Because students had been able to construct an imagined name for the recordings, it made sense they would want to do so for the other aspects of identity. When I saw the demographic form through their eyes, it did seem absurd that the only things hidden

from my future academic audiences were their actual name and the name of the school, while everything else I report has to be 'real.'

This relates to something Jimmy Smith asked me before our second interview. I was explaining to him that Bryan and I had chosen the name "The Anchor School" for their school's pseudonym, and that on the recording I would call him by his pseudonym. He asked me why that was necessary, and I explained that it was to protect their privacy. I told him I needed to make sure that no one reading something I wrote about the class would be able to identify the school or the students, even though that was highly unlikely. I further explained that he or the other students could tell anyone they wanted about their participation, and show others articles I wrote and identify their quotes, but it was not my right to do so. Despite the low risk of our study we still had to follow the rules. He understood, and said "at this point, it's more of a tradition to do it this way" (fieldnote, Oct. 7, 2014). This caused me to reflect on the purpose of IRB protocols. In a study based on social justice, using pseudonyms does take away students' potential for action and impact. Had we been able to interact online more as we had originally planned, not using their real names would have kept them safer from online predators and bullying, but it would also have prevented them from making an identifiable personal stance. By pushing against and questioning the average university research protocols, students exposed the protocols' limitations.

Teachers Resisting the Average

At times Morgan, Bryan, and I would intentionally trouble students' perceptions and push them to question average ideas or beliefs. Many of these adult-initiated average resistances dealt with race. An example that stands out was when Morgan explained colorblind to a group who read the term in an article on healthcare:

> Let me tell you what this word colorblind means. If you claim that you're colorblind, then you're claiming that you don't see people's color, skin color. Like 'I'm colorblind, I don't see color, I see all people as the same.' That is all fine and well, except when we do that, it always happens that white people benefit. That's just the reality. So, what they're saying here is that their public policy is colorblind, meaning, they're claiming not to see who gets it [healthcare] and who doesn't. But the results, what's happening, is that people of color are … not getting as much care as they should. (transcript, Sept. 23, 2014).

Morgan explicitly explained how claiming to see everyone as the same, and believing that the average experience is good for all groups, is actually a fallacy. This is an important explanation for these students in particular, who have likely never experienced the negative effects of a colorblind mindset. Morgan also explained that claiming you treat everyone the same and actually doing so are rarely equivalent, a distinction that is sadly not well-known in our society. While this is a longer monologue from an authority figure than was typical in our class, in this case it was a beneficial interruption to the student dialogue.

Summary

Resisting average ideas, expectations, and norms took many forms throughout *Math for a Cause*. This theme relates to ideas of resisting normalization and sameness (Britzman, 1995a). My investigation into this theme came from Ally, the concrete thinker who by the end of the course realized that averages were not universal truths. Students were also resisting average societal norms for defining racial categories. They resisted average ways of thinking promoted by their school, and felt that their teachers wanted them to all have the same opinion. This resistance to sameness was also seen in Sum Dood's discussion of comments on a conservative website's article on same-sex marriage. Sue Denim and Aiden resisted our average expectations for student behavior by ignoring our assignment guidelines. Jimmy Smith and others resisted the research process itself and caused me to question norms mandated by research boards. Lastly, Morgan intentionally asked students to resist average conceptions of race.

CHAPTER 9: "I DON'T THINK THE ANSWER IS THAT IMPORTANT": ABANDONING CLOSURE

With the students of "Math for a Cause," we found that initially they had greater difficulty with problems that did not have an easy answer. Our students, in initial interviews and surveys, thought of math as "worksheets" and "textbooks," rather than an exploration or a process. In our society we view numbers as exact, as 'real,' as fail proof. They were thrown off when they were asked to estimate (for an example, see question two on Appendix H), when there were multiple ways to solve problems, or when different answers were possible. Most of this confusion was directly related to math, though there was also a connection to social issues. Part of this might have been the age and maturity level of our students. During in a focus group on social justice several teachers at The Anchor School mentioned that there was just something that happened when students were in seventh or eighth grade, as opposed to fifth and sixth, that allowed them to think in more abstract and complicated ways (personal communication, Nov. 5, 2014). Perhaps this is true, though it could also be that the school was not pushing their younger students to think of their world other than in its concreteness.

One of the school's tenets is the "belief that truth is continually revealed" (The Anchor School mission statement, citation omitted for anonymity). While this tenet also includes the "belief that answers are dynamic, not static" it still implies that there is truth. It further implies that there is a *single* truth; the mission does not say anything about the possibility for multiple truths, or that truth may look different to different people. The tenet of truth goes on to say they have a "commitment to look beyond and beneath the obvious, searching for truth and identifying falsehood." This juxtaposition seems contradictory. How can one search beneath the obvious if

you are still engaged only in searching for truth or falsehood, and not engaged in the nuances that exist between these two poles? These tenets do not necessarily have a direct effect on teaching at The Anchor School: I did not ask the teachers to examine the mission and reflect on how it effects their personal teaching strategies or well as the school's overall learning environment. Yet I cannot help but wonder if this belief in a truth was hindering some of our students from engaging in the possibilities for a more flexible world view.

Many students—and likely teachers, too—think of learning as concrete. Math class in particular is victim to this line of thinking. Yet even numbers and the way we think about them are socially constructed. Additionally, we are conditioned to view the 'hard' sciences like biology and chemistry as somehow more prestigious and well-respected than the 'soft' sciences like sociology, that deal with words more than calculations. As Warnick and Stemhagen (2007) posited, emphasizing a traditional mathematical pedagogy in which there is only one correct method and answer may encourage students to think that there is one correct approach to mathematical inquiry. In turn, this may translate to an assumption that social issues also have one right answer and way of approaching them (Warnick & Stemhagen, 2007), leading students to believe in a simple dichotomy of right and wrong.

This chapter will explore moments in class where abandoning closure was wrestled with by students and researchers. Abandoning closure was experienced here as embracing the idea of multiple answers and/or multiple ways to solve the problem. It also encompasses the idea that some things cannot be solved and thus have no answers. This theme was found in class discussions about social issues as well as math itself, as students became open to a conception of mathematics separate from worksheets. At other times, they learned how identity categories were not finite and were affected by cultural and societal norms. All these examples will be

discussed here in relation to the students, and I will include a reflection on my own abandonment of closure that came during the data analysis process. For teachers, abandoning closure had to do with curriculum planning, namely how to leave the tasks open and not giving students well-defined tasks and numbered lists of instructions. As will be examined, this was more difficult than we imagined.

Abandoning Closure as Queer

Abandoning closure fits within a queer framing because queer theory "celebrates the unformed, [and] inchoate" (Turner, 2000, p. 9), and strives to remain outside of normativity. Queer pedagogy, like other pedagogies that have equity as a goal, does not describe a set of specific techniques, and is instead a way of approaching pedagogy. Luhmann (1998) went further, stating that queer pedagogy should be thought of as a question. Furthermore, queer people do not necessarily live within gendered or other binaries. They are border crossers (Anzaldúa, 1987), living outside of society's normal boundaries. In this way, abandoning closure (in the form of letting go of well-defined categories) can be useful in talking about both queer the *verb* (meaning the questioning and tangling of borders, limits, boundaries) and queer the *noun* (meaning people who identity as other than heterosexual and/or cisgender). Both queer the verb and queer the noun were evident in the ways students, and the teacher-researchers, engaged with moments and ideas in which there were no singular and/or correct answers.

While all pedagogy should be flexible, queer pedagogy may be purposefully open and uncertain to challenge students and teachers to question not only heteronormativity, but also the norms of instruction, schooling, and content. This lack of concrete answers can cause students to struggle, yet struggle is seen by many queer pedagogists as a necessary part of an emancipatory, queer education (Jacobi & Becker, 2013; Weems, 2007). Scholars have written about this

inclusion of struggle using other words such as 'crisis' (Kumashiro, 2001), 'problematize' (Macintosh, 2007) and 'trouble' (Goldstein, Russell, & Daley, 2007; Meyer, 2007). All of these terms are used by scholars who described some kind of internal struggle on the part of the student that has a causative or generative effect on their learning.

Students Abandoning Closure

Letting Go of the Right Answer

The idea of acknowledging a lack of closure first came to my attention when I was comparing the first interviews Bryan and I conducted during the first few weeks of the course with Ally (sixth grade girl), Jimmy Smith (fifth grade boy), Mia (seventh grade girl), and Sum Dood (sixth grade boy) with their interviews after the course was finished. In general terms, these students had gone from thinking of math as something with one right answer to thinking of it as open to possibility. This transformation was echoed in the four focal students' pre- and post- class surveys (see Tables 9 and 10 and the discussion in Chapter 10 for further comparison of the surveys). Jimmy declared "the meaning of math is endless!" (student work, Nov. 11, 2014) in his post survey. When Bryan and I asked him to elaborate on his definition and feelings about math in his interview, he said "There's not one way to do math. There's multiple ways" (personal communication, Nov. 12, 2014). This was a big conceptual jump from his first interview a month prior, when he said that to do math means "It's usually just solve a problem" (Oct. 7, 2014). The 'just' in his first answer suggests that the solving was simple or that there was one way to find a solution.

Mia, who confessed that she did not really like math and had a very narrow view of it in the beginning of the course also experienced an alteration in her thinking. During our post-course interview, I asked her about her survey:

Summer: About math you said 'it means to figure out problems and diagrams, it's like a puzzle,' and you said you'll 'always be trying to understand it.'
Mia: Yeah. So, I guess, no one is actually done learning math or an expert on math because you're really always learning. (personal communication, Nov. 14, 2014)

This quote ties to the previously discussed theme recognizing the puzzle, but her point that "no one is actually done learning" illustrates her belief that there is no singular, well-defined end-goal. She is holding on to multiple possibilities, rather than limiting herself to one.

Sum Dood had a similar shift in thinking. In his post-class interview, he said "I don't think the answer is that important" (personal communication, Nov. 14, 2014). When we interviewed him the first time on Sept. 30, 2014 he said "I often try doing it a different way to see if, partly because I want to see if I get the same answer but partly because I'm less likely to have something wrong, but like, just do it differently." It is evident that he did have some conceptual framework of math as more than an answer and involving a process, but there was still the concern about getting the correct answer. To go from this focus on the right solution, and sharing on the first day of class that he liked math because it has rules (field note, Sept. 4, 2014), to letting go of the right answer altogether was astounding to Bryan and me. This was not something we were intentionally trying to instill as a new value for our students, but it is one that came about generatively through the processing that occurred during the course. As with many of the other results, the messiness of the student-centered class structure led to this new conception.

Considering Multiple Interpretations of Mathematical Calculations

Returning briefly to a class discussion about the U.S. prison system and the percentages of different racial groups in prison discussed in Chapter 6, we found that students began to see that there were multiple ways to interpret mathematical calculations. In order for students to practice calculating percentages, Morgan created a worksheet on U.S. prison populations divided

by race (See Appendix F for the worksheet). The following excerpt from our whole-class discussion shows that eventually, some students were able to see the possibilities for multiple interpretations of their calculated percentages.

> Morgan: Number 3 asks what conclusions can you make from this math, OK, but this looks like a whole bunch of jumbled numbers… This is the problem with trying to pull math out of real life things or articles is you can get stuck on just doing the actual math problems, and then you just have a bunch of numbers and think 'Wait what do all these numbers mean?' So Sum Dood, can you tell us what all these numbers mean?
> Sum Dood: Well, we have a lot of um- more than half of our uh population is in prison.…
> Morgan: How about the percentage of the world's population and prisoners, the percentage of the population of prisoners in the world?
> Sum Dood: Either we're real efficient and catch all the crime, or we're the same amount of efficient as other countries but we just have more crime, or we put a lot of people in jail without investigating enough.
> Morgan: Hmm. So a number of different things. (transcript, Oct. 21, 2014)

To Morgan and me (Bryan was not present on this date), the percentages demonstrated a flawed justice system as the population of different racial groups in U.S. prisons was disproportionate to their population and indicated a flawed system. However, while this messages were clear to the two of us, it was not immediately evident to the students, and we discussed all of Sum Dood's proposed explanations.

Strategically Using Closure

In examining recordings of the 'podcast boys' (Sum Dood, Sue Denim, and Justin Case) working on their final project, they knew that multiple interpretations of their findings were possible but wanted to purposefully manipulate their final product to promote their desired response. For their final project, they wanted to see if there was a connection between state same-sex marriage laws and suicide rates, in the hopes that they could encourage more states to make same-sex marriage legal[11]. They researched suicide rates for each state, but found no

[11] This class moment occurred in Nov. 2014, before the June 26, 2015 ruling by the Supreme Court that made same-sex marriage legal nationwide (*Obergefell et al., v. Hodges, Director Ohio Department of Health, et al.*, 2015).

detailed information about the known or assumed causes of suicide. Thus even though they were able to find a small correlation, but from their limited data findings a 'real' answer was unclear.

While Justin Case wanted them to present a strong causal relationship and declare that there was a definite connection, Sum Dood pointed out that they did not know for sure that the anti-same-sex marriage laws led to increased suicide rates. Justin Case was less concerned with what they knew, however, than sending a message and insisted that a strong, concrete statement was necessary to influence others to vote in favor of same-sex marriage. Justin Case asked Sue Denim to "please delete the 'but that might not actually happen' [that he had initially included on their website] because we want to actually send a message and not just 'oh yeah, maybe'" (transcript, Nov. 4, 2014). While I know Justin Case was capable of thinking abstractly and accepting ambiguous data interpretations from my conversations with him, in this case he felt that he needed to send a concrete message to prove his point. This showed he was used to messages being singular and inflexible. Furthermore, he knew that numbers can be used to promote a political view only if they appear singular and cannot be used to declare only a "maybe." Closure here was now understood as strategic and a way to manipulate, rather than a goal in itself or a finite truth.

Teachers Abandoning Closure (Sometimes)

Part of my own value in multiple answers or questions with no answer likely comes from my background as an English teacher. While when I taught writing I wanted my students to be precise and constantly wrote "be more specific" in the margins, teaching students to interpret texts was not a precise procedure. With literature, it is acceptable to be unsure what the writer intended, and to come up with multiple ways to interpret a text. I was delighted if students came up with a different interpretation from the ones I emphasized in class. As English teachers often

teach their students, as long as you can support your interpretation with the text, anything is fair game. A student who is able to look at a text from multiple perspectives, and hold multiple answers as 'true,' is a successful one in an English classroom. Yet in math classes, students are used to completing an assignment where every problem has only one correct answer. They rarely, at least in a K-12 classroom, are asked to interpret or draw conclusions from their calculations. In *Math for a Cause*, not only were they having to create their own problem and to solve it on their own, but they also had to learn that difficult conceptual lesson that there may not be *one* correct answer. There may not have been a possibility for any answer at all.

A Need for Structure

I would be lying if I implied I was able to give up closure so easily. Given this was a classroom where some things must be accepted as reality or truth, there were times when concrete answers felt necessary. Scaffolding is such a successful teaching strategy because it allows students to have support while they are learning a new skill, and then those supports can be taken away when they are ready to complete a task on their own. So it was with our class: we felt we needed to have some concrete structures and beliefs in place. Without it, the students were lost and could not function- or at least, that is what we thought when things got messy. Some of this support was in the form of our instructions and the way we scaffolded- or did not- their learning. At times, we took away too much support too quickly, and their task was so open that they were frozen.

While at first we wanted students to search through articles and data on their own, we found that this extreme openness was actually limiting and prevented them from trying to create and solve math problems. For example, in the second unit we grossly underestimated how difficult it would be for them to find an article that focused on a social justice aspect of the topic

and was on their reading level. During the same unit, Morgan worked with a group researching education funding. With Morgan's help, they narrowed their focus and found information on funding differences in communities with varying poverty levels. Still, this too much information for them to sort through and Morgan ended up dictating to them how to create and solve their math problem. I had a similar experience with another group who worked on same-sex marriage and Christian responses. Instead of abandoning closure, Morgan and I were giving it to them in our desire to give them a problem they could solve. After class, we laughed together about how we were the ones who completed the math problems, not the students (field note, Oct. 9, 2014). Teaching turned out to be tightly intertwined with closure. (See Appendix D for the critical literacy handout the group used for their second article. It also has some mathematical jottings. Compare to the group's respective 'completed' math worksheet in Appendix I).

From these experiences, we learned that we needed to give students some direct instruction and guidance so they could focus on the social issues and their math, rather than sorting through data. If the sorting step had been eliminated, they may have been able to get to a better comfort level with the idea of abandoning closure around their particular social issue. Groups that were able to find concrete data right away, like the "podcast boys" and the suicide rates, were able to have a more nuanced conversation about the subtleties of the issues. In this way, narrowing the focus allowed for more rich conversations rather than conversations focused on finding and sorting through information. It was difficult to find a balance between giving them too much information and help and not giving them enough to pursue their interests.

Struggling with Abandoning Singular Beliefs for Social Justice

I also found myself struggling with abandoning closure when I wanted the students to view social justice issues a certain way. Sometimes this contradicted with the way Morgan

conducted the class. For example, in the first unit on Ferguson, Morgan was always careful to say things such as "some people are saying the shooting was racially motivated because Michael Brown was unarmed" rather than saying more conclusive statements like "because the officer was white, and Michael Brown was an unarmed black teenager, we can assume the shooting was racially motivated." I found that even though in general I want to value ambiguity and multiple possibilities, in these cases I was unwilling to see any other possibility. To me, it seemed harmful to entertain other possibilities with equal weight when black teenagers' lives were at stake. Justin Case came to the same conclusion when he went for strategic closure with his group's website.

Yet, without letting students explore these ideas on their own, I was in danger of doing what Ally saw her school doing- of enforcing a progressive, yet singular, belief system. In her post-course interview with Bryan and I, Ally told us that she thinks the school wants to make them think a certain way (personal communication, Nov. 12, 2014). And even if that certain way is more in line with equity, denying them the opportunity to explore why a way of thinking is more equitable than another may do the students more harm than good. Rather than letting them find out for themselves why a certain viewpoint was more in line with social justice, I found myself wanting to tell them so much it felt physical, and I clenched my fists to prevent myself from walking to the front of the room and taking over.

Hearkening back to a previously-discussed theme, I wanted students to recognize the puzzle but then come to a quick conclusion that agreed with my assessment of the situation. While Morgan was quick to say "that's your opinion" when the students professed a belief, I never felt the need for this caveat. At the time I was frustrated with this habit of hers, as I thought she was being too soft and denying that ideas and opinions have real manifestations. But

now, I can see that she was not only being careful not to strongly project a liberal ideology on the students, but also encouraging them to think through their beliefs. In my strong emotional reactions to events like the murder of Michael Brown, I was not capable of letting the students hold this questioning at the center, which DePalma (2010) suggested is part of a queer pedagogy practice. This speaks to the difficulty of practicing queer pedagogy when teachers have been trained to draw lessons to a logical conclusion, and our own emotions may prevent us from leaving lessons open-ended. I am grateful that my desire to follow Morgan's leadership in the classroom prevented me from spouting an enthusiastic tirade about the dangers of our legal system, as it would likely have alienated the students and broken the student-centered classroom we had created.

Summary

Abandoning closure was not easy for the students or for me. It meant acknowledging the possibility that there may be multiple answers, or no answer, in relation to both mathematical calculations and social issues. However, when students were able to grasp this concept, they made conceptual gains as they were able to accept an open way of thinking rather than one with well-defined answers. Students told us remarkable things about how they did not think answers to math problems were that important and that they will always be learning. They gained practice discussing difficult topics, such as systemic racism, and were able to talk through their feelings about it even though they felt uncomfortable. I believe these skills are crucial to social justice work.

I also had to accept this as I struggled with the balance between letting students struggle and giving them enough scaffolding to function. During the course I first left things very open-ended, but had to add more scaffolding as we progressed. Now I wish we had done things

backwards: starting with more scaffolding and slowly pushing them to stand on their own, as is standard teaching practice. However, this mess and uncertainty is what led to our students' conceptual leaps. At times when I felt frustrated with the study as it progressed, and was searching for some sort of concrete proof that we had succeeded in teaching the students something valuable, I found that in fact one of the most valuable lessons was that concrete proof, in the form of student work, is not always present and may not be relevant. The open conversations they had with each other were where their growth was happening. This is difficult for teachers, as in a classroom you are required to have concrete proof in the form of test scores and report cards. Thus even with the hindsight that comes with data analysis, I am still hesitant to abandon closure completely, and wonder how maintaining a balance can work in classrooms bound by concrete expectations. Perplexingly, it was only when I (falsely) concluded that the students were not learning while in a meeting with my advisor was I able to discern their learning. In that moment, I finally began to abandon idea of my dissertation study completing with student learning happening as I had imagined, and began my attempts to abandon closure and embrace the mess of queer pedagogy.

CHAPTER 10: CONCEPTUAL SHIFTS: ACCOMPLISHMENTS OF MATH FOR A CAUSE

When I began analyzing the data, I was stymied by my quest to find evidence of queer pedagogy through what was in the literature: the questioning of norms, boundaries, limits, binaries, and especially those involving heteronormativity. Increasing feelings of despair emerged as I tried to code for critical literacy and math directly from those bodies of literature, and was left with little evidence. However, I was seeing other things that seemed queer, as they were outside of the course's subject matter and transcended my own expectations. These moments synthesized as the learning mechanism for the course—*processing*—and resulted in the three analytical themes: *recognizing the puzzle* (learning to see the world and knowledge as abstract and nuanced; asking why), *resisting the average* (learning that average is not always best or accurate), and *abandoning closure* (letting go of a singular correct answer or way of solving problems). Perhaps rather than tenets of queer pedagogy (which queer pedagogy theorists would likely deny the existence of, as tenets indicate something static), I was finding evidence of the *enactment* of queer pedagogy. When I removed my own boundaries of what I thought I needed to find, I opened myself to more nuanced and playful possibilities for reading the students' experiences.

Stability/Mobility

In Jackson and Mazzei's (2011) exploration of analyzing qualitative education research with post structural theories, they explain that Foucault was working against the idea of a stable subject and instead was interested in the subject as formed by shifting identities. The authors further explain that "subjectivity is not stable, but is constructed in relationships with others and

in everyday practices" (p. 52). Rather than static, fixed subjects Foucault believed in subjects that had blurred borders, making Foucault's work influential with queer theorists. Similarly, Jackson and Mazzei (2011) wrote that "Butler's theory of gender performativity works to unsettle the stabilizing gender categories that attempt to normalize and regulate people" (p. 72). However, I argue that shifting identities and deconstructing identity categories does not mean identity moves from stable to unstable. I argue that identity is *mobile,* which has a slightly different connotation, and can also include various degrees of temporal stability.

When I think of stability I think of kayaking. As my father taught me, the boat is more stable when it is in motion than when it is still. If you try to still the movement, you are more in danger of tipping over. As Hytten (2008) discussed, sometimes students are uncomfortable with instability. When students do not want to make conceptual shifts, it is like they are panicking in a rapid and trying to stand in a moving kayak, rather than working with the river to keep moving. The river, like our course, may take twists and turns, and there may be blockages that cause you to paddle to shore and walk around them. The route is not the same for everyone and depends on the current context.

Students may also get nervous when things are not what they seem—such as our class discussion on racial discrimination and the U.S. prison system. In a boat, primary stability indicates the feeling of the boat when it is sitting level. Secondary stability is the feel of the boat when it is tilted over on its edge. Navigating your own learning, or the boat, requires agency (paddling and shifting your weight with the boat) but also relies on context and circumstance (the river) that are outside of your control. You may have to shift between your primary and secondary stability at different points along the way. But as long as you can ride the edge in your secondary stability, you can keep moving. The students in Math for a Cause were

frequently in their secondary stability, as they were pushed to consider new ideas and changed the way they conceived of math, social justice, and their school. Without being in that state, or even being in the boat to begin with, these conceptual shifts would not have occurred.

Ambiguity Leads to Conceptual Shifts

As I wrote in the thematic introduction, the work of processing enabled students to gain comfort with ambiguity, and thus led to them recognizing the puzzle, resisting the average, and abandoning closure. Some of them remained uncomfortable with ambiguity, but others were able to accept that some things can never be known. Mia (seventh grade girl), who at first thought math was all about worksheets and textbooks, transformed into thinking of math as puzzles and diagrams. Jimmy Smith (fifth grade boy), who did like math from the beginning and always did the calculations in his group, also experienced some expansion. He said math is change, and though when he said 5 + 3 = 8 he meant the 5 and 3 changed to 8, rather than something more metaphorical, this was still a change in his own abstract thought.

Math Shifts

Analyzing the pre- and post- course surveys taken by all students illustrates conceptual shifts. In the first survey, we asked students "What does it mean to be good at mathematics?" (class materials, Sept. 4, 2014). Answers were primarily about understanding rules and procedures-- "to know many rules" (Justin Case, student work, Sept. 4, 2014) and "understanding and remembering formulas and problems" (Mia, student work, Sept. 4, 2014). For the post-survey, we asked a slightly different question: "Describe what it means to 'do math'?" (class materials, Sept. 4, 2014). This change in wording, combined with their work over the trimester, produced more nuanced results that dealt more with process: "Doing math is putting numbers together and getting an answer" (Ally, sixth grade girl, student work, Nov. 11,

2014) "solving problems that have to do with numbers" (Ashley, sixth grade girl, student work, Nov. 11, 2014) and "to use numbers or facts to find out an answer" (Rosette, sixth grade girl, student work, Nov. 11, 2014). It could be argued that answer shifts were due more to the change in the question instead of changes within the students; however, the attitude shifts seen in the surveys reflect shifts found in other data pieces, such as class and group conversations. While there is still a focus on getting an answer, it is not the only focus of their responses. See Table 9 (at the end of this chapter) for comparisons of student answers about math on the pre- and post-course surveys.

There were also students who did not experience a shift in thinking about math, such as Aiden (fifth grade boy) who went from "someone who get mathematics" (student work, Sept. 4, 2014) on the first survey to "add, subtract" (student work, Sept. 4, 2014) on the post-survey. Similarly, Sue Denim (seventh grade boy) initially said that being good at mathematics meant "to b [*sic*] able to save [solve] math" (student work, Sept. 4, 2014) and on Nov. 11, 2014 he said that to do math meant "math equations like 1 + 1." Notably, these students rarely participated in processing with their classmates. They usually worked alone, even within a group, and did not participate in many dialogues or reflections about mathematics or social justice. Thus, Aiden and Sue Denim did not do the work necessary to see beyond their pre-conceived notions of either math or social justice. These two students imply that dialogue, reflection, and engaged play are vital to student learning and that without them, growth may be minimal or non-existent. It is impossible to make such an assumption with only two students, but it seems telling that they are the only two who did not participate in processing with their classmates.

Social Justice Shifts

The interviewees (Ally, Mia, Jimmy Smith, and Sum Dood) also showed shifts in the way they thought of social justice. In their initial interviews (conducted between Sept. 25 and Oct. 2, 2014), participants said that at school social justice was talked about in terms of community service and accepting differences. Mia indicated she was realizing how many "problems with education in spending" there were from her contemporaneous group project (personal communication, Oct. 2, 2014). The first interview was when Sum Dood, as discussed in the "recognizing the puzzle" chapter, began to wonder why people who are against same-sex marriage hold those beliefs. In their final interviews, conducted between Nov. 11-14, 2014, students were more reflective. Jimmy noted that his ideas and feelings about social justice had changed, because "I sort of heard about it before but I never really pondered it that much" (personal communication, Nov. 12, 2014) illustrating the importance of processing. Sum Dood was still grappling with his "why" questions, when he said "I think a lot of the things, like, like don't make sense why not or why they should or why they shouldn't" and he further said "I think it's stupid that they [Christians who oppose same-sex marriage] can control another person's life" (personal communication, Nov. 14, 2014). Mia said that she began to notice more social justice issues in the news. Ally showed the least growth, as when we asked if her feelings had changed she said "I knew everything I knew before, and I didn't like, my opinion didn't change" (personal communication, Nov. 12, 2014). See Tables 11 and 12 (at the end of this chapter) to compare interviewee answers in their first and second interviews.

Other students also showed room for the capacity to grapple with ambiguity in their shifting conceptions of social justice. In the beginning of the course, we did not expect students to have a working definition of social justice. When they were struggling with the question "Describe 'social justice' in your own words" (class materials, Sept. 4, 2014) I gave the

examples of fairness and equality. Naturally, seven out of the ten participants used one or both of these words in their definition. The post-class survey from Nov. 11, 2014 showed more variety, and we also asked an additional question- "How do you feel about social justice?" Rosette (sixth grade girl), who on the recordings of group work spent most of her time giggling, answered "I think that some things are confusing, and that it's never going to be 'right' for everyone" (student work, Nov. 11, 2014), This sophisticated answer was a pleasant surprise for me, and showed me I had been underestimating her. Izzie (seventh grade girl) answered "social justice is problems that are not fisical [fixable] most of the time." Justin Case answered that social justice is "fairness for all" and he felt "it should be everywhere but is not." These student answers illustrate that for the most part, students saw social justice as a problem that is hard to define and even harder to solve. They began to see that there is nuance to both what social justice is and how to approach it.

However, Aiden and Sue Denim continued their pattern of little growth that was seen in the math questions. When defining social justice they answered "the equality of people in social justice" and "being equal with the race and gender and social stuff," respectively, (student work, Nov. 11, 2014). They both answered "good" to what they felt about social justice, in stark contrast to their classmates' reflective responses. Again, this would seem to imply that students who do not process with classmates to not experience growth in relation to social justice. It could be argued that students can engage in some processing on their own, particularly reflection, but this was not captured by our data collection. Further work is needed.

Reflections

At the end of the course, I was happy when I looked at the surveys and conducted interviews with Ally, Jimmy Smith, Mia, and Sum Dood. On Nov. 14, 2014, Bryan and I processed our thoughts together:

> Bryan: Sum Dood had contextualization as a math skill, which I liked....
> Summer: It was pretty perfect. And I think Mia has really grown a lot, a *lot.*
> Bryan: I think so too.
> Summer: She's the one who said to me in the first interview, math is doing a worksheet. And I don't know, a mathematician is a crazy scientist character
> Bryan: Now she had Galileo, and the idea that math is never done.
> Summer: Right?! I was like this is so profound now, I am amazed! [both laughing] I kind of wanted to be like, Bryan! We did something! I'm so happy this wasn't a waste of their nine, 10 weeks! Yeah, I'm feeling much better about the course, reading these evaluations and doing the interviews.
> Bryan: That is interesting. It'll be interesting to see what Morgan says, because it goes to the idea of how we measure progress. If I gave them a pre-test post-test math worksheet I don't know what we would have seen.
> Summer: Maybe we would have found out sooner that they couldn't do percentages, but-
> Bryan: I don't know what we would have seen in terms of growth, because how do you show growth in increasing awareness of math as a process. It's not going to show up in a skill-based anything.
> Summer: No.
> Bryan: And I don't know that we, you know, that we gave them any skill-based anything in math. But it seems like we gave them some broadening of what math *is*.
> Summer: … Cause that's pretty powerful.
> Bryan: It is powerful, and it's not something we think about. Even with the Common Core State Standards for Mathematics … what is math and how do we do math, we still don't teach kids how to broaden their perspective of what is and isn't math. …
> Summer: Especially for someone like Mia in particular. Like Ally, I'm not surprised that that didn't happen for her. ... It's probably not going to happen for her ever, that's just the way she's made. But, ... for Sum Dood who came in liking math and on day one said he likes math because there are rules. And for him to go from that-
> Bryan: To this-
> Summer: To it's a process, is huge.
> Bryan: Yeah.

While we had often felt we were floundering- and we were- the students did come out of the course with new understandings. As discussed above, these new understandings were not content-based and could not be evaluated with the Common Core State Standards. Instead, they

had made abstract gains in the way they conceived of mathematics. This likely came from the extended time students had to talk to each other, both to figure out their topics and to reflect on them.

Though initially I worried that Morgan expected more skill-based outcomes from the course, she too valued these conceptual gains. The class also allowed her to better understand her students' thoughts and capabilities. When we spoke after the course was over, she summed up the experience as:

> I think there were some great things that came out of it. I think there were some things that if we were to do this again we would change up. But overall, I feel like it was a good experience for everybody. I was really excited at the prospect of a social justice math class, so that was fun to even get to talk about that and plan that. (personal communication, Nov. 18, 2014)

Again, the results of Math for a Cause went beyond our expectations in a positive way. The conceptual shifts illustrated that it is possible to create a change in mindset, even in a 10-week trimester. To reach these shifts, processing is key. If we had continued working with these students, I think their mindset could have shifted further, and they would have been better prepared to apply this mindset to the difficult work of finding possibilities for mathematics in social justice.

Table 9
Students' conceptions of math (student spelling preserved)

	Pre-class survey 9/4/14		**Post-class survey 11/11/14**	
Student	What does it mean to be 'good' at mathematics?	Do you enjoy mathematics?	Describe what it means to "do math"	How do you feel about math?
Aiden	Someone who get mathematics	Yes	add, subtract	Good
Ally	To know division, multiplication, subtraction, addition tables in your head. I'm also I one of the higher classes for 6th grade.	all the time! It is my favorite subject.	Doing math is putting numbers together and getting an answer	Math is an opportunity to use your brain and have fun with numbers
Ashley	understanding what you are doing	Yes	solving problems that have to do with numbers	It is a challenge, but fun!
Izzie	that u can do the math without help	sometimes	math is hard and it does not mean anything to me	I just keep trying to learn it
Jimmy Smith	to understand well what you are learning	Yes	The meaning of math is endless!	It is fun
Justin Case	to know many rules	Yes	solve	I like it but it is still hard.
Mia	Being 'good' at math means understanding and remembering formulas and problems	Naturally I do not	To figure out problems and diagrams, it's like one big puzzle.	I feel like I'll always be trying to understand it.
Rosette	That you understand things well enough to do them correctly, and you feel comfortable with it	it depends, but mostly yes	To use numbers or facts to find out an answer.	In most areas confident, but in more complicated parts, I feel unsure and don't enjoy it as much
Sue Denim	to b able to save math	Yes	math equations like 1 + 1	good
Sum Dood	be able to know how to do the problems	Yes	to set up an equation	I really enjoy it

Table 10

Students' conceptions of social justice (student spelling preserved)

Student	**Pre-class survey 9/4/14**[1]	**Post-class survey 11/11/14**[2]
Aiden	the rights for equality	The equalaty of people in social justice; [it's] good
Ally	fairness for all people, equality, justice socially	Social justice means that you get your freedom and fairness that you deserve like everyone else; I feel that everyone should have justice
Ashley	being able to be friends with whoever you want	Social justice is when everything is equal to everybody; [social justice is] hard!
Izzie	equality (written inside of a peace sign), social justice helps the communite and just helps general things	Social justice is poblems that are not fisical [fixable?] most of the time; I think social justice problems need to be fixed
Jimmy Smith	equality	Social justice is when ther is equality and justice in the community; I think that if there was more of it the world would be better
Justin Case	equality for everybody	fairness for all; I think it should be everywhere but is not
Mia	Social justice to me is standing up for what you belive in to benefit others.	Social justice is standing up for unfair treatment of those around you; I think it's really important for everyone to think about.
Rosette	unfairness, fairness, rights, equality	Making everything equal and fair for everyon; I think that some things are confusing, and that it's never going to be 'right' for everyone
Sue Denim	having justice in your everyday life?	being equal with the race and gender and social stuff; [it's] good
Sum Dood	I think of it as equality and fairness	It is about equality and rights and things that are stupid but true; I really learned a lot of information that is hard to believe

Notes: 1. Describe 'social justice' in your own words. 2. Describe social justice in your own words. How do you feel about social justice?

Table 11
Interviewees' conceptions of social justice from the first interview

Student, Interview Date	How is community service or social justice talked about at school?	Have your feelings about social justice changed from the class?
Ally, 9/25/14	They [Quakers] also believe helping others is very respectful, like if you don't have something and somebody else does and they're not willing to share then that makes you feel bad, that you don't have it.	[no data]
Jimmy Smith, 10/7/14	It's usually [talked about as] community service, cause in the handbook it says community service.	Maybe a little bit- cause I never really thought about… the different percentages of different people and their living standards and that type of stuff.
Mia, 10/2/14	It usually gets talked about in our advisee groups. We talk a lot about it and we work on it… we set goals, like what we want to do for the community and we like really work on the goals, like for ourselves and for other people.	I went on like a civil rights trip last year so I already knew a lot, but um, I didn't really realize there was so much um so many problems with education in spending. From my recent project I learned that.
Sum Dood, 9/30/14	It's definitely talked about openly… people, like, at the school like try and talk about it to the whole school instead of just like their friends or something.	It made me more trying to understand why the people who don't like gay marriage … don't like it. … Whenever I did this kind of thing [before], I'd look for more why they *should*. And now I'm trying to look at the other side.

Table 12
Interviewees' conceptions of social justice from the second interview

Student, Interview Date	Can you elaborate on your definition of social justice from the survey?	Have your ideas and feelings on social justice changed?	Do you notice social justice issues more?
Ally, 11/12/14	I was more directing to non-white people and same-sex marriage couples, that sort of area. Where the government like don't give them social justice. Or any justice at all, and they think they're a different kind of animal, sort of?	Uh-uh, no I don't think so. Because I didn't learn anything about- well I did learn- but I mean I knew everything I knew before, and I didn't like, my opinion didn't change.	Yeah, like I said my friends and if like on the news my dad and I listen to it on the way to school and there's something about social justice or something, my ears don't really perk up I guess you could say, but now I'm like "oh!"- like yeah.
Jimmy Smith, 11/12/14	If people like are equal then there's probably not going to be as many fights about who's better or not better. And that leads to justice. And if that's everywhere, then everywhere's basically going to be better.	Yeah, because I didn't really know much about social justice before this class… I sort of heard about it before but I never really pondered it that much.	Yeah…Like the election, with the different people who are being elected and their opinions about things.
Mia, 11/14/14	It's really important for everyone to think about social justice because unfair things happen to people every day I guess and, I don't know, they might be doing unfair things to other people and not even realizing it. So, just yeah, to keep in mind. [Unfair treatment means] Like, calling someone a name cause they're gay, or like favoring someone that …	I guess I am noticing political issues more, like around elections and things. There's other things going on in the state and the country. I guess I am.	[Answered in previous question]

Table 12 *continued*

Student, Interview Date	Can you elaborate on your definition of social justice from the survey?	Have your ideas and feelings on social justice changed?	Do you notice social justice issues more?
Mia, 11/14/14	…um, who has something when a lot of other people don't, picking them out kind of. So yeah, I guess that's it.		
Sum Dood, 11/14/14	I think a lot of the things, like, like don't make sense why not or why they should or why they shouldn't. Like, uh, no gay marriage I don't understand that. Why do they- I think it's kind of stupid that they care about, like, other people. Like but, I don't think they should care. I think it's stupid that they can control another person's life because something like, like gay marriage and stuff like that… I think um using religion as an argument for it is kind of- I don't think that's good- cause I don't think you should be able to say my religion says you can't, so you can't.	I think they really changed a lot because when I first signed up for the course and did stuff, I didn't really know what it was. Well, I knew what the class was I really didn't know what social justice was. Like, I know I was part of [the GSA] and I was for gay rights and all that, but I didn't, I didn't think of it as a social issue. Well I did think- like social justice, I didn't really know what that meant.	I've noticed in like YouTube comments. I used to have no clue what they were talking about, and I thought, I didn't think, and then I found out what stuff like, a bunch of the stuff they're saying is racist and sexist or something.

CHAPTER 11: CHALLENGES

Despite successes from the course, I do not want to leave the reader feeling the study was worry free and magical. As with any study or teaching experience, there were frustrations. It would feel dishonest to end my analysis section with triumph, so instead I will end with my challenges. This is an intentional queer move. Following Miller's (1998) work, I agree that the typical teacher story arc is tired: 1) teacher was unprepared, 2) does research or completes more teaching practice, 3) becomes enlightened. That is not the way teaching is experienced, which is messy and has many

> 'tangles of implication'—how we are implicated in our desires for and enactments of, as well as in our fears and revulsions toward, those identities and practices that exceed the 'norm.' Furthermore, autobiography as a queer curriculum practice can intervene in the practice of defining ourselves through already available and legitimized discourses. (Miller, 1998, p. 371)

Our course was not the norm, and as I fumbled through it I did not feel enlightened or all-knowing. I was purposefully working against the norms of a traditional math course, but also fearing that I was straying too far from the norm (if there is such a thing) of queer pedagogy. For example, when the students were focused on same-sex marriage, I worried this would not be 'queer enough' for my queer education colleagues. In radical queer communities, marriage is often viewed as heteronormative and decidedly un-queer. The challenges faced were not all about my paranoia and feelings of inadequacy, however. This chapter will describe challenges faced in a few arenas of the study: social justice compared to community service, school norms, the research process, course planning, and student experiences.

Social Justice vs. Community Service

A constant challenge Bryan and I faced was the idea of social justice versus community service. Starting a few weeks into the study, Bryan and I began talking about how we didn't see social justice in The Anchor School. This was a surprise to us, as when we read the school's mission statement we read social justice into it, but when we reexamined it we found the phrase "social justice" is never actually used. We intuited something that was in fact absent. Thus, we had wrongly assumed that the school practiced social justice and so a course like ours would be easy in a place like The Anchor School, which we thought had already trained students with a social justice mindset. To use Avery Gordon's (2008) terms, we were haunted by the ghost of social justice from the mission and anecdotes we heard from parents. But it was not even a real ghost, it was one of our imagination. We began to see that social justice practices were absent, and in its place was a community service that was Othering towards populations outside the school. When a teacher spoke about a program that takes The Anchor School kids to a local elementary school, she said:

> I think it's really important for our kids who are really sheltered sometimes to go into a public school environment. And this school is wonderful. And the kids who come out of public school and find a safe haven here, you know, they look at it differently from here going back in. So it's all about perceptions, and all about what's good what's bad. There's some things that they do well that we don't do well. (focus group, Nov. 5, 2014)

I found this sentiment disturbing. Though she is pitching her opinions as generous to the public school, it is clear that she thinks her students are better. Taking sheltered students to a public school so that they see their own as a "safe haven" just furthers the classism inherent in a private institution. Morgan voiced discomfort with this mentality when she discussed the school's community service program with me (personal communication, Oct. 21, 2014). She told me she hated the way community service at the school was usually conducted as (a) privileged kids go to another space, (b) clean it up, and (c) come home unaffected. She wanted their service to be

long-term projects based on students' passions for topics. Though she did not use the words social justice, her description of an ideal service project was more in line with social justice teaching practices than community service.

Signs of this Othering were also present in the school building. Next to the kitchen, there was a picture I found unsettling. It was of a boy and girl of color in school uniforms, placed above a handwritten snack menu. A sign explained that money from the snack bar went to these students. I honestly did not read it carefully enough to see where the students lived, as I found it too Othering and uncomfortable, but I suppose ignoring it is just as bad. On another wall around the corner were pictures of girls in head coverings, and signs about a pen-pal relationship between the schools. To me, these pictures pointed out the paucity of diversity within the school, rather than showing that the students were learning about other cultures or helping other people. These images, in combination with the conversations with the teacher focus group, did not mesh with the feeling I *wanted* to have about the school: a place where diversity was embraced. Instead, it seemed a place where diversity was looked at as occurring elsewhere while the students remained insulated in their homogenous environment. It is easy to say you embrace diversity when you rarely interact with people who look differently from you on a day-to-day basis, and merely write to them or visit their schools now and then for a community service trip. As Morgan put it when I interviewed her, there is a difference between care and commitment (personal communication, Nov. 18, 2014). Claiming to care about other people—seen as outsiders—is not the same as having a commitment to fostering diversity in your own environment.

When Bryan and I interviewed the students, they confirmed our suspicions that community service was different from social justice at their school. We asked them if their

school did social justice and they usually said yes, but their examples were limited to discussing issues in Meeting for Worship sessions (Ally), or the GSA (Sum Dood and Mia). Jimmy Smith hilariously said "we even have a big banner up there that says um- I actually don't know what it says …I know it has something to do with social justice" (personal communication, Nov. 12, 2014). When we probed further by asking if the community service days had anything to do with social justice, they stated that those days were not usually related to social justice. Ally said "it depends on what the group's doing" (personal communication, Nov. 12, 2014) as each advisee group chooses their service project. Jimmy Smith thought "some people do an environmental thing, so that's not really social justice" (personal communication, Nov. 12, 2014). When I asked him if this was because those issues are not related to people, he replied "Yeah. Like, just going and picking up trash" (personal communication, Nov. 12, 2014). It seemed the students had a better understanding of what their community service projects really were than most of the teachers. As Bryan and I noticed, and Morgan commented on, the service projects were not connected to their curriculum or broader ideas of inequality or systemic oppression. However, as we only interviewed four students and had ten total in our study, I cannot make conclusive statements about the school culture. I have no confirmation that the majority of students shared these sentiments. Despite this, I could not ignore that the students were speaking to a feeling that had been creeping over Bryan and I the more time we spent at the school, and think there is value in giving weight to the opinions of these students.

Mia and Sum Dood had more specific thoughts about the differences between social justice and community service, related to action. Sum Dood was heavily involved with the GSA. He described the work the group did as social justice because "we're arguing that like these people, for people who don't have rights that they should really" (personal communication, Nov.

14, 2014). The key word here is "arguing"- a verb, an action. Mia also described social justice as action. In addition to talking about the work of the GSA, she mentioned a group of students at the high school (The Anchor School has four schools all together: preschool, elementary, middle, and high school) who "did something to help people to vote…And they had a movie and a newsletter and things. So they got the word out, and they helped people" (personal communication, Nov. 14, 2014). When Bryan and I were reflecting on these interviews afterwards, I told him that a few mornings prior I woke up in a panic, as I thought we had not talked about action being essential to social justice work. It appeared that my panic was unfounded, as with or without our intervention, at least these two students knew that action was required for social justice. Morgan deserves a lot of credit for this mindset as she was constantly asking the students to think about what issues they felt passionate and "fired up" about, which led them to think about what they could do.

School-level Challenges

Other than the school staff's mindset towards service, there were other institutional level challenges we faced. One, a belief in truth, was tied directly to the school's mission. As this belief was discussed in previous chapters I will not repeat it here. Others are not necessarily particular to The Anchor School and would be faced no matter where we conducted this course. The two challenges discussed in this category are time and the perception of elective courses.

Time

Our class was held during seventh period, and we met only on Tuesdays and Thursdays. This was the first time Morgan had taught an elective on Tuesday-Thursday during seventh period. Our schedule also meant she did not have a planning period on *Math for a Cause* days, and she had underestimated how much that would affect her energy levels. Seventh period was

the last of the day, so we ran into the typical challenges the end of the school day brings. Students who played sports often left early, anywhere from 10 minutes to 40 minutes. It was also hard to keep everyone's attention at the end of a long school day, particularly as seventh period was after lunch and advisee group meetings[12]. Sometimes students were late if their advisee group had taken a trip or was having a particularly intense discussion. Thus, rather than being refreshed from their break and ready to work, students often seemed finished with the day and with schoolwork. They had a hard time keeping still, though being in tutor rooms when working in groups did allow for more movement without disrupting their classmates. Morgan thought that if our class was in the morning, we would have had better results asking the students to think critically. She imagined that if we had asked the same questions of her early classes, students would be able to make connections between ideas quicker and easier (personal communication, Nov. 18, 2014).

Morgan also observed that the point of the school year in which a course is offered can make a big difference in student engagement and achievement. In our interview on Nov. 18, 2014, she mentioned that there are certain classes the school does not offer during the first trimester, such as human sexuality. For middle school students, a lot of personal growth and maturity can happen over the course of a few months. Furthermore, the fifth graders are making the transition between elementary school and middle school in the fall, and by the spring trimester they are more settled. She speculated that if we had taught this course in the spring, as originally

[12] All students were placed into advisee groups with a teacher of their choosing, so that the groups were made up of students from all grades. They did fun activities together, and the advisor was also responsible for checking on the students' academic and emotional well-being throughout the school year.

planned[13], it would not have been as difficult to get the students thinking and talking about our difficult topics.

Electives

As the course progressed we learned that both students and teachers did not take electives seriously, and they were not used to having high expectations in these classes. One teacher said to me that she liked the idea for our class, as she wished the school would develop more rigorous electives and hold the students accountable to higher expectations for these classes (personal communication, Sept. 27, 2014). When Bryan and I walked around the building to visit students in different tutoring rooms, we noticed that many other classes seemed to be playing, at least to our eyes. Students were playing football, running around seemingly unsupervised, and sometimes interrupting our students and distracting them. While some of this was likely due to the very different atmosphere of the school, which is much freer than the standard public schools Bryan and I had worked in, we wondered if the standard classes had the same levels of relative freedom. Certainly, the school had placed the electives at the end of the day to prevent the core classes from being interrupted by early dismissals for sports.

The lower expectations were confirmed through discussions about how students would be evaluated. At The Anchor School, rather than students getting a letter grade on a report card, teachers write narratives about the students' work and progress in the course. While I support the idea of students learning to be intrinsically motivated and believe that many times grades are arbitrary, it was still difficult for me to accept that there were no grades. My expectations of teaching were challenged. This frustration was increased when Morgan did not grade students' work or even make comments. At the time, I did not reflect on our initial conversations where

[13] Morgan had originally suggested we hold the course in the spring of 2014, but due to scheduling conflicts for all parties we moved it to the fall of 2014.

Morgan told me she considered this my and Bryan's class, so it is no wonder she did not comment on student work. However, this lack of feedback likely affected student motivation, especially when the students were specifically asking for this feedback.

Towards the middle of the course, I started writing comments on their completed handouts so they would see we were looking over their work. Though I did not write a grade on it as that would violate our IRB protocol, I wrote things like "interesting point" or "what do these numbers make you wonder?" to encourage them to go further with their explorations. I could have asked Morgan more directly to grade the work, as the students were asking for her input too, but I felt that pushing would be overstepping my boundaries. Instead, I made passive-aggressive (and unproductive) comments like "Do you want to look at these before I scan them?" but she would always say "No, I don't need those." She said that to write their narrative evaluation, she would be talking about growth, behavior, and how she saw the student progress through the course. I did ask if that was the same for all her courses, and she stated that for her morning classes she would include test scores and more concrete data (personal communication, Oct. 21, 2014). As Bryan and I discussed after this conversation, this proved to us that the school did not take electives as seriously (or normatively) as core classes. In retrospect, perhaps I could have reminded her that Bryan and I were not allowed to evaluate student work, and thus reminded her that in that aspect she had to take on the more traditional teacher role. However, I am not sure that reminder would have impacted her actions, as it still would have gone against the norms of elective classes at The Anchor School. It was unrealistic of me to expect her to value electives from my point of view, though I can only see that retrospectively, as at the time it was a source of great frustration.

Research Collaboration

As may be deduced from the previous section, the biggest challenge I faced with the research process was collaboration. Sometimes there can be too many people in charge, such as when students were working in groups and would be interrupted by me, Bryan, and Morgan in turn. Listening to the recordings from these sessions I learned that sometimes we all gave different suggestions for their research direction. I also had grand expectations when we began that Bryan, Morgan, and I would collaborate fairly equally on planning and executing the course, but this did not happen. Looking back, I see that I ignored much of our first planning conversation with Morgan (which took place August 12, 2014) and heard what I wanted to hear, rather than what she was actually saying.

As mentioned previously, when we met with Morgan before school started she told us that she was excited for the course but saw it as our project: that we should feel free to tell her what we wanted her to do as the instructor. I stated that I wanted to talk specifically about our working relationship, as when I was a teacher there was a group of researchers who came during my second year and I and my coworkers found the experience highly frustrating. During this discussion we planned to run the class collaboratively. Though Morgan was the instructor, Bryan and I would help lead discussions on occasion, talk to students, and help them with their work. I was excited about this at first, though later I would become frustrated when Morgan took more of a back seat than I wished. I did not realize that when she said it was our course, this meant that if we wanted her to take a role we would need to communicate that to her (even though she clearly indicated this in that first meeting). To combat this dynamic, I would purposefully stand in the back of the room, ask her to lead certain parts of the class, and rely on her leadership. As the course progressed, I finally realized that I needed to be clear on what I expected each of us to do on a particular day. Though we did not talk about our working

relationship beyond this first meeting, overall I felt it worked. Morgan would express frustration sometimes with how the course was going, or how tired she was from teaching all day, but overall our collaboration was highly positive and each day we briefly reflected on what went well, what we wanted to change, and the plans for the next class meeting.

Because this project was for my dissertation, I was the most invested in our team of three. This I expected. But Bryan was also writing his comprehensive exams, so was only able to come to one class a week and was not able to take extensive field notes, create materials, or listen and transcribe to the recordings. As such, we were not regularly comparing field notes as I had originally imagined or dividing the transcribing workload, though we did have many reflective conversations which I recorded and transcribed. I created most of the course materials, found articles and websites of data for the students, and planned most of the activities. Much to my surprise, I even created some of the math handouts, though Morgan or Bryan led class discussions focused specifically on math topics. Morgan stepped into the planning mostly when we needed to redirect, and after she had some negative parent feedback after the school held parent-teacher conferences. At that point (Oct. 21, 2014, week seven of the trimester), we asked for feedback from the students to plan our last unit. So although I remain committed to collaborative research and want to collaborate with teachers, in this case I found it was more challenging than I had hoped. Even though the relationship worked out, I had to keep reminding myself that no one cared as strongly as I did about the process, and that I could not expect Morgan to take ownership of something she saw as someone else's project. This reinforced the idea that true collaborative research should come from the school's and/or teacher's needs and interests (e.g. Heath, 1983) or be action research conducted by classroom teachers, rather than

stemming from my own desires as an outside researcher. Though there was mutual interest in this case, it was not enough for equal investment.

Course Planning Challenges

Unsurprisingly, the students faced many challenges completing our difficult coursework. Their hardships challenged our own conception of the course and altered our creation of course materials. Due to the school's conception of elective courses, they likely also expected this class to have a lighter work load. Here, I will discuss the challenges faced with math and literacy.

Math Ability and Experience

Bryan and I were relying heavily on Morgan to gauge what type of math skills the students had and for her knowledge of the students' personalities. Since the school was small and there were only three 5th graders enrolled in the class, she had taught most of the students in previous years. She knew many of them liked math, and the ones who did not she thought probably enrolled in the class because of the social justice aspect. Aiden was the only student she was worried about, and it turned out that he did the least amount of work and showed the least progress compared to other students.

However, Morgan had assumed that just because students had learned how to do a math skill in the past, that they could correctly apply it to a new situation. The biggest example of this was with percentages. As I was the only one out of the teaching team listening to the recordings of student conversations during group work, I knew that percentages were a problem. For example, during the second unit I heard Jimmy Smith (fifth grader) talking about averaging the percentages from different survey questions. I knew this was incorrect, but I was not confident enough in my own math skills to be able to explain this to the students. I voiced my concerns to Morgan, but she thought the difficulty was from Jimmy's lower grade level, and that the older

students in his group should have corrected him. She asked his group members if they had checked his work, and they admitted they had not. We had a mini lesson on percentages on Oct. 14, 2014 and this helped some, but I still noticed problems when students struggled to complete Morgan's handout on the U.S. prison system. It was not until we discussed this worksheet on Oct. 21 that Morgan realized none of the students were fully capable of calculating or interpreting percentages. As described previously, this class discussion was a turning point in our class as far as conceptions of social justice and teacher realizations of student mindsets, but it also taught us that the students needed a lot more specific math instruction than we had anticipated.

Critical Literacy and Information Literacy Skills

Though I was impressed with the students' critical literacy skills of finding the power and belief systems inherent in the articles they read, sorting through piles of information to create their math problems was daunting. During the first unit, Ashley, Ally, and Rosette kept getting tied up and distracted because they were looking at articles on racism and police shootings that were text and information heavy, and so had a hard time sorting through the information that they needed versus the information that was irrelevant. If they had been able to find better databases instead of articles, that would have helped, but those they did find were hard to sort through as well. For example, a website they were looking at for state populations was throwing them off by detailing where different immigrant populations came from and lived, which was not directly tied to their question of finding the racial makeups of different states to compare that to police shootings as aggregated by the race of the victims. This is perhaps a hindrance to critical math- it takes students a long time to sort through the informational and critical literacy part to get to the mathematical considerations and calculations.

Students also had a difficult time using search terms that produced good information. Though Morgan told us that all students had completed research projects and should know the basics of research, as a former English teacher I knew it was unlikely they were skilled in this area. The research process is difficult to teach no matter the age and experience level of the students. However, as we had only a short time together, I thought we would just have them try researching and see what happened. To go back to Ashley, Ally, and Rosette's search for police shootings, they searched for "racist police shootings." That did give them results, but rather than sites with data that they could interpret for themselves they were reading opinion pieces. Having a discussion about how so-called 'neutral' sites like databases are not going to use words like racist, and that these phrases are how the authors of the articles described the data helped a little, but they still struggled. In this case, the girls were looking for data that confirmed what they already believed, rather than interpreting the data to see what story it told. During our second unit, I listed specific research strategies on their handout (see Appendix D) which helped some, but as students were not always paying attention to their handout they frequently needed reminders when they struggled to find relevant information. Many times even I could not find information that was both relevant and at a reading level or format that was comprehensible to middle school students.

Allowing the students to choose their own articles during the second unit proved more difficult than we had anticipated. Though we decided that each group would get their article approved by one of us, I sometimes approved articles that were above the students' reading level. I was not used to screening reading materials for this age group, and often failed to realize the complexity of articles on these nuanced topics. The three of us decided after the unit was over that we had removed too much scaffolding too soon, and the students floundered because of it.

Because of these difficulties, the continued difficulties of creating math problems, and lost class time due to assemblies and holidays, this second unit took much longer than anticipated.

Also, though we had hoped that students could comment back on their articles with their mathematical calculations, their reading difficulties and lack of suficient time to finish their math prevented this from happening. In one case (the marriage equality group in the second unit) Ashley and Justin Case did make comments in response to what they viewed as hateful messages about LGBTQ people on a socially conservative website. However, these comments were not approved by site moderators and so did not appear. Most students chose to read their articles in print rather than online, which further distanced them from any potential online interaction with other readers. As previously stated, when Bryan and I first conceived of the course, we thought the online interaction would the largest and most exciting part, but it ended up being left out completely.

Students' Personal Challenges

Aside from the challenges students faced with the course materials and loose structure, students' personalities, personal experiences, and relation to the course provided additional challenges. As with previous sections, here I focus on the two predominant ones: privilege and resistance.

Privilege

As The Anchor School is a private school, the students were privileged. There is no school bus, except to use for sports and field trips, so everyone is driven to school. I wondered how students who were on need-based scholarships, whose parents might be in lower income brackets and have jobs with less flexible schedules, were able to come to school. You would not necessarily know students were privileged by the way they act, however. Snobbery was not

something I witnessed among the students. But I overheard several casual conversations about getting the latest iPhone, tablet, laptop, or gaming system, which caused me to raise my eyebrows in surprise. Students also talked about nice vacations they went on, or parents who had prestigious careers at one of the local universities, or in medical or technical fields.

Privilege was also strongly tied to whiteness in this space. A teacher told me that during the fall trimester a student called another student "the N word" for the first time, and the staff had no idea how to handle the situation. According to this teacher, race in contemporary America was not discussed at school, let alone how contemporary conceptions of race are tied to the past. This, combined with the fact that students do not see racial diversity around them, made talking about current events involving race (like the murder of Michael Brown) difficult for them.

This lack of knowledge about race relates to Bauman's (2004) work on privileged white students, who she described as living inside a bubble. Those outside the bubble remained unnoticed and the school felt like summer camp where the community sat under a "cloud of niceness" (Bauman, 2009, p. 200). Though students in *Math for a Cause* could recognize that a white cop killing a black teenager is suspicious and likely racist, they remained uncertain. As I discussed with teachers, the students were likely grappling with questions such as: What does it mean that they are white, are they bad too? The few black students they know are nice- does that mean the news might be biased? What does that say about their school? These uncomfortable questions are perhaps harder for the white students to address in their nearly all-white space, where racial oppression is something that took place in the past and was bad, but it is probably fine now. The question seems to remain: how can the school claim to be a place of inclusion, if it seems there is no real effort is made to diversify the student and staff population?

Resistance

As is common with any classroom work on social justice, we faced resistance from students. However, this resistance was not in the form I would have expected from reading the literature (e.g. Kumashiro, 2001; Warren & Hytten, 2004). Returning to moments discussed in Chapter 8, we faced the most resistance from Sue Denim (sixth grade boy) and Aiden (fifth grade boy) during the second unit. The pair had chosen environmental issues as related to social justice, but were unwilling to do any research. They simply wanted to talk about things they already knew, which for Sue Denim meant turtles, particularly endangered sea turtles. Naively, I had not anticipated students taking advantage of the relative freedom of the class to justify their own socially-conscious beliefs rather than learning of different ways of considering a subject. Even though I agreed that protecting sea turtles was important, my teacher self was annoyed with Sue Denim for refusing to follow directions and purposefully altering the assignment to do what he wanted, rather than what I wanted for him. I did not want the boundary-crossing of queer pedagogy to infringe on what I saw as my ultimate authority as teacher. This incident was complicated by the fact that Aiden generally had difficulty focusing in class. He was frequently off task and seemingly in his own world while his classmates worked. As I described in my field notes during this time,

> Sue Denim and Aiden were doing their own thing- they seemed to have forgotten what Bryan and I discussed with them, of looking into people using animals for religious/cultural beliefs and instead Sue Denim was busily typing up everything he knows about turtles or snakes- I'm not sure which. I asked if Aiden was looking for an article related to that, that had a different opinion from theirs that they could respond to. But Aiden was distracted too and interested in just looking up snakes…. I talked with Morgan about how I was concerned, and she asked if I was OK that they weren't focusing on social justice. This reminded me of the conversation Bryan and I had with them about cultural beliefs- before I had forgotten myself as I was too concerned they were way off task and just wanted to get them back on. Morgan asked if she needed to give direction as the teacher and I said yes- but I went in to try again so she could talk to another group. After I reminded them again that we were talking about social justice in this class, and that it involves groups of people, I said that they should try looking for

> something else and again stressed that they weren't supposed to be writing a report. Sue Denim then found an article about people who use snakes in their religion, and how it was against animal cruelty laws, so I told them that was a good place to start. Morgan came in, and she asked Aiden to read the same article too, and for them to get out their worksheet and start answering the questions. (field notes, Sept. 25, 2014)

Sue Denim and Aiden were resisting the course itself. They were pushing against our authority in a way that I found unproductive, though I am sure they would disagree. While we eventually convinced the students to investigate snakes and turtles in relation to social groups, they only did so superficially, and only to fulfill the assignment. They were not investigating the topic of animal sacrifice in religion so much as begrudgingly acknowledging it to meet the minimum of our expectations. Unfortunately in this case, we were not able to successfully merge their passions with the course goals. This moment shows that I was still hanging on to many normative expectations of schooling despite my desire to embrace queer pedagogy: teachers have authority even when students choose their projects; students should follow teacher instructions; and students should complete the assignment in the way the teacher conceptualized it.

Summary

These challenges depict a richer, more entangled picture of Math for a Cause than can be understood looking by looking at the analytical themes alone. They also highlight, as Mia (seventh grade girl) pointed out in her final interview, the process of doing research: "one piece fits and one doesn't, and one method works and one doesn't. So it's kind of like a puzzle then. But when you have the puzzle, you have the concept. A better understanding," (personal communication, Nov. 14, 2014). While I used this quote in the "recognizing the puzzle" chapter, I feel it is worth repeating here as it aptly describes what research is like in the moment. During the research process and planning and executing of the curriculum, many challenges came up that pointed out things we had not considered or imagined. They also illustrated the messy complexity of trying to take complicated critical theories and apply them to an actual classroom.

Looking at the challenges faced by conceptions of community service compared to social justice; research collaboration; school norms; the course curriculum and design; and student resistance, the narrative of the course and research project takes many queer turns and resists the normative narrative of a class experience that is easily concluded into a neat and tidy endpoint.

PART 3

CHAPTER 12: SUMMING UP *MATH FOR A CAUSE*

Writing a conclusion for a dissertation study that thrives on messiness, blurring boundaries, and abandoning closure seems an exercise in absurdity. A conclusion would seem to negate this study's queerness, so in resistance to this I think of it as a form of queer futurity (Muñoz, 2007). As Muñoz (2007) stated, "queerness, if it is to have any political resonance, needs to be more than an identitarian marker and articulate a forward-dawning futurity" (p. 357). In *Math for a Cause* queerness was both an identity marker and a change in the way students viewed learning. Queer futurity deals with the "not-yet-here (the future) and the no-longer-conscious (the past)" (Muñoz, 2007, p. 353). It is a way to imagine the unformed future while simultaneously acknowledging the past, to see inchoate possibilities and create "not an end but an opening or horizon" (Muñoz, 2007, p. 360). The horizon is at the edge of our gaze, somewhere we can see but not completely, something we know but not totally, something beyond. In a framework of queer futurity, there can be no conclusion because queerness is in the "not-yet-here" future present on the horizon.

However, for clarity's sake I will summarize my findings and describe my journey in *Math for a Cause* in this chapter. I want to reiterate that this dissertation is not a clean narrative of a teacher struggling, trying something new, and ultimately succeeding. As Miller (1998) stressed in her chapter on autobiography as a queer curriculum practice, this simplistic narrative arc is not an accurate portrayal of teaching and certainly was not how I experienced this dissertation study. Instead, my own emotional state had many extreme highs and lows as I

worried that the students were not learning, and/or Morgan was unhappy, and/or that the course was not working. Thus, I will not write this conclusion under the assumption that the course ended perfectly with all students finishing with enlightened perspectives about math as a process and ready to become social justice activists. Instead, I will address my original research questions, summarize the themes from the data analysis (processing, recognizing the puzzle, resisting the average, and abandoning closure), and describe the shifts in thinking (or lack thereof) in my focal participants (Ally, Jimmy Smith, Mia, and Sum Dood) as related to the analytical themes. I will end by reflecting on my own experience of the course and data analysis, and discuss my own messy emotions caused by the chaos of the course.

Research Questions

My original research questions were:

1. [Primary question]. How does queering math for social justice promote a social justice mindset and action in students, as seen through these criterion: 1) having a critical consciousness, 2) taking action to give people from all social groups equal access to resource and opportunities, 3) acting with love and compassion, 4) providing healing and hope for all people, 5) participating in a socially engaged spirituality [the Quaker way] (Rendón, 2009)

Related questions:

2. Is there evidence of queering (both in the curriculum and in student's work and conversations), as seen by: questioning norms, limits, ignorance, and reading practices, (Britzman, 1995a) and the queering of everyday moments (DePalma, 2010).
3. Are students performing acts of critical literacy, as seen through these practices: coding, text-meaning, pragmatic, and critical? (Freebody & Luke, 1990)
4. Are students using the above practices in critical math? How are these practices enabling students to: use mathematics to read the world, use mathematics as a tool to analyze social issues; look for relationships between the social issues? (Gutstein, 2003)

When I initially analyzed my data, I stuck closely to the literature and coded directly from my research questions. For example, to look for evidence of social justice I looked for "critical consciousness;" for queer pedagogy "questioning norms;" for critical literacy "critical practices;"

for critical mathematics "using math to read the world." And while at times I did find evidence of these elements, I realized that they alone did not tell the whole story, or even the most interesting part of the story.

There was evidence of social justice pedagogy and critical literacy as defined in the literature in student work, but less of critical math. As far as evidence for social justice pedagogy goes, the students were at times showing evidence of *developing* a critical consciousness as they discussed social issues such as police brutality and LGBTQ rights. Students had no opportunity to take action in terms of resources, though they did act with love and compassion as well as embody a Quaker spirit of inclusion of diversity- at least in terms of LGBTQ issues. In their final project, in which Morgan asked them to make a product that could be seen by those outside the school community, they sought to provide hope and healing to LGBTQ people who fought for marriage rights. For critical literacy, students engaged in the four practices described by Freebody and Luke (1990): (a) they practiced "coding" when they were able to read news articles, (b) "text-meaning" when they comprehended an article, (c) "pragmatic" when they could navigate websites and other documents for use with their projects, and (d) "critical" practices when they successfully discerned the power relations evident in a text. The students did not use math to read the world, for the most part, but they began to see that this was a possibility as they learned that numbers could be interpreted using the same critical skills they used for text. Similarly, while the students were not always able to use math to analyze social issues or to see the connection between social issues, they were gaining a nascent awareness that this was possible.

During the analysis, queer pedagogy stood out as the most salient and interesting piece of the puzzle. While there were times when students questioned norms or limits, the ideas from

existing literature could not fully describe the queer experience of our class. The students' enactment of processing led to the themes of recognizing the puzzle, resisting the average, and abandoning closure. Processing-- or the incorporation of dialogue, reflection and engaged play—is absent from the existing literature on queer pedagogy and can inform future work in the field. The other themes are expansions and elaborations of existing ideas in queer pedagogy regarding boundary blurring and dissolving. These queer themes and revelations all incorporated social justice pedagogy, critical literacy, and critical math to different degrees depending on the context. The next sections will summarize the findings for each of these themes.

Processing

Processing was the enactment of student learning in this course. From listening to student conversations, it was clear that in this context processing had three interconnected elements: *dialogue, reflection*, and *engaged play*. Dialogue is defined here as student-centered conversations where all parties are engaged in talking about the subject and related ideas. Reflection is an emotional event that occurs when someone is thinking not only about their reactions to something, but their role in the subject or event. These reflections occurred through dialogue with other students or teachers, in interviews, or when specifically asked to reflect on course materials. Engaged play occurred when students spontaneously played with the material or subject matter outside of teacher intervention. Meaning, this is not the playing of a formal game in the classroom, but happens when students have fun with the materials on their own. Together, these elements are how learning happened.

Recognizing the Puzzle

This theme was the first standout from the data analysis. As the study progressed, Bryan (my co-researcher) and I noticed that although students were not necessarily gaining concrete

mathematical skills they were gaining capacity for abstract thought. This theme means that students were recognizing that their reality is complex and full of nuance, rather than containing concrete and single views and solutions. This recognition is vital for anyone studying social justice, as these issues are complicated and involve multiple perspectives, and so cannot be understood from a single viewpoint. Recognizing the puzzle happened as their perspectives broadened and they began asking why. Students like Mia went from thinking of math as completing worksheets to a puzzle that could never be solved. This conceptual shift was astonishing for Bryan and I, particularly as Mia initially told us she did not like math as a subject. Student questions (including why their school promoted certain views, why these views were considered good, and why and how people had different opinions from them) informed their new opinions and inquiry work in class.

While The Anchor School taught its students to be compassionate and accepting of differences, our students were realizing they had never discussed *why* they should do so. Sum Dood began to wonder why conservative Christians opposed gay marriage and was curious about the origins of these opinions. In learning to recognize the puzzle of social justice, math, and their own opinions, students' worldview was expanded and they gained the capacity for conceptual thinking. These expansions relate to queer pedagogical ideas of rethinking how one reads the world (Britzman, 2012) and thinking of pedagogy as a series of questions rather than answers (Luhmann, 1998).

Resisting the Average

I define this theme as the discovery that the average way of being, thinking, acting, or believing is not the only way. This theme stood out initially through Ally's interviews. Throughout the course she struggled with the contrast between her preferred structured

worldview with our fairly free-form course. To my surprise, in our second interview with her she told us that when she examined opinion polls that listed percentages of opinions for several near-identical questions that "there's more to the average," (personal communication, November 12, 2014) and that the average answer was not necessarily indicative of a singular truth.

This realization is the most profound example of a phenomena happening with several students. Early on in the course, many students created math problems that focused on finding an average, whether or not that average told them anything about what they were investigating. Through their continued research and our guidance, they began mathematical investigations that relied on comparisons rather than averages that blanketed difference. Students also began resisting average opinions held by the school (that accepting differences between people actually means thinking that there are no differences between individuals) or society (that people of color are more violent, and that is why they are overrepresented in the prison system). This theme relates to queer theory and pedagogy's rejection of norms and sameness (Britzman, 1995a; Goldstein, Russell, & Daley, 2007; Luhmann, 1998; Weems, 2007), but I chose to call it "average" instead of "norms" because The Anchor School is outside of the norm already because of its Quaker approach to learning. This does not mean, however, that it is without its own set of normed beliefs.

Abandoning Closure

Learning to let go of a singular right answer, and acknowledging that some things may never be solved, were important insights students gained from the course. These insights related both to students' conceptions of mathematics and social justice. Additionally, this theme illustrates how interconnected all three are as this abandonment of closure went hand in hand with recognizing math and existence as a puzzle, and resisting average ideas. Some of our focal

students illustrated this theme in their final interviews. Mia told us that she had learned "no one is actually done learning math" because it is a continuing learning process (interview, Nov. 14, 2014). Similarly, Sum Dood told us he no longer thought that getting the right answer was the purpose of math, a far leap from his initial definition. In Jimmy's post-course survey, he even declared that math is endless. Students also learned that math could be used to illustrate this possibility for multiple (or a complete lack of) answers, when they learned that statistics on crime and prison populations were not definitive of social realities.

This growing comfort with non-answers is valuable for a social justice mindset. It is a common assertion of social justice practitioners that you are never finished learning about these topics, or working towards creating more equitable realities, and that social justice "is both a process and a goal" (Bell, 1997, p. 3). Perhaps this acknowledgment can help these students in the future if they engage in social justice activism and inevitably encounter problems that do not have easy, singular solutions. This theme relates well to queer theory, as questioning norms and boundaries (Britzman, 1995a) can include a questioning of the norm of closure and the boundaries created by a singular right answer. It also relates to DePalma's (2010) suggested practice of letting questions hang during class discussions rather than providing a teacher-justified answer.

In Sum

This study demonstrates that queering the curriculum increases students' capacity for nuance, critical thinking, and asking questions. While students did not gain many new mathematical skills, with the exception of (re)learning how to calculate percentages, the conceptual gains were profound. Students also gained a deeper awareness of current social justice topics, primarily racial discrimination in the police force and same-sex marriage rights.

At the time of writing, both of these topics are still prominent in the media and hopefully our students have the capacity to understand and reflect upon reports on these topics.

Reflection

My own process to get to these conclusions has been a messy one. Many meetings with my advisor were spent venting my frustrations and confusions about the course. I agonized over every curriculum decision, and then watched them unravel as the teaching team worked with students, constantly reflecting on our teaching and readjusting as we went. I was not truly able to recognize the puzzle that was *Math for a Cause* until several months after it had concluded, when I was out of the messiness of teaching and looking at my carefully color-coded data in my qualitative data analysis software. Taking this regimented view was a necessary step for me to see that this messiness was part of the accomplishments of the course, even though I found it chaotic and unnavigable at the time.

While writing I had to resist the average depiction of teacher narratives described by Miller (1998), and the normative arc of research studies as described in academic articles, where everything comes together in a neat package with a theoretical framework that is efficient and seamlessly describes the findings. Looking back on what I wrote in my reflections about Morgan, I saw that I was trying to impose my own average opinions about classes and teacher expectations onto hers. I wanted her to take this class 'seriously', but in the school environment electives were not serious and my expectations were unrealistic and problematic. Hindsight also makes me see that when I had an emotional breakdown over the course in the middle of the trimester, and frantically told George that we were failing and students were not learning, this was when I was forced to abandon closure. I had to get over wanting students to have easily-recognizable gains to be able to see the incredibly abstract gains that were happening. Talking to

the students, and listening to their group conversations, helped me to embrace this queer journey of ambiguity and messiness. This messy web of student learning and resistance can be hard to capture, and impossible to duplicate, but I hope that anyone reading this dissertation will try to accept and revel in the messiness of their own classroom experiences and see it as a possibility and cause of learning, rather than a hindrance.

CHAPTER 13: IMPLICATIONS AND POSSIBILITIES

In this chapter I will explore what lies beyond *Math for a Cause* in relation to teaching and research. Returning to Muñoz's (2007) ideas on queer futurity, I will consider the "the queer residue and simultaneous potentiality" (p. 357) created from this study. I begin with what I feel is the most significant contribution of this study: possibilities for queer pedagogy. I will also discuss implications for teaching, research, Morgan and The Anchor School, and the queer futurity of this work.

Implications for Queer Pedagogy

While it is engaged in the present, pedagogy is poised towards the horizon of possibility and thus engaged in futurity. The literature explored in this study—social justice education, queer pedagogy, critical literacies, critical math, and new literacies —are perhaps even more focused on futurity as their emphasis, particularly in social justice education, is on action that creates change. This study showed that these frames of pedagogy can be combined in a physical classroom, as they share common priorities of questioning, dialogue, and critical reflection. Because queer pedagogy was the lens through which the other theoretical frameworks were viewed, I will focus on it. Given Luhmann's (1998) suggestion that queer pedagogy is best thought of as a question, I will consider a few new questions of my own that resulted from this study: (a) What is beyond the boundaries of the usual queer pedagogical tenets? (b) What remains when you remove all the boundaries and limits? (c) How are our own perceptions queered through our work with youth? I will ponder each question in turn.

Queer pedagogy's tenets are typically described in the literature as questioning normalcy (especially heteronormativity), reading and teaching practices, and boundaries and limits (Britzman, 1995a). These tenets are meant as ways of interrogating pedagogy, not necessarily of enacting teaching practice. However, I attempted to include these tenets in my own study, and looked for evidence of them in my data set. There are few research studies using queer pedagogy and so there are few examples of what it might look like in action. DePalma's (2010) work with primary school teachers is one such example; however, his work focused on the teachers whereas I was interested in the students. His description of queering everyday moments came from teachers inserting queer pedagogy into their curriculum, not from students queering the curriculum regardless of teacher input. As described in the analytical chapters, I found additional tenets of *processing, recognizing the puzzle, abandoning closure*, and *resisting the average*. While these tenets are related to the ones in the existing literature, they could not be bound by those standards. What I found in *Math for a Cause* was beyond existing tenets of queer pedagogy and specific to my particular context. The finding that the students in my study were enacting queer pedagogy through *processing* is a new contribution to the literature. I hope to continue investigating this aspect in future work and to examine queer processing in the classroom in more depth.

The idea of looking at what queer pedagogy *does* rather than what it implies or suggests leads to a discussion of the second question- What remains when you remove all the boundaries and limits? At our current social moment it is impossible to imagine a world without boundaries, particularly those that define social constructions such as sexuality, gender, race, class, and so on. Our lives are legislated and structured around these constructions so much that without them many are left only with fear and confusion. One example that was resonant throughout my study

was the issue of marriage equality. While the Supreme Court of the United States recently granted all couples the right to a legal marriage (Obergefell et al., v. Hodges, Director Ohio Department of Health, et al., 2015), this does not change the structure of marriage itself but instead expands it to be more inclusive. A society where marriage is abandoned completely in favor of other forms of legal rights and privileges outside of marriage is likely not to be seen in my lifetime.

Turning back to the classroom, we found with the students in *Math for a Cause* that even when the normal instructional boundaries—in the forms of scaffolds and teacher-led activities—were removed, and the students were confused and often frustrated, learning was still happening. In the moment, I read this frustration as an indication that the class was not working. I was struggling with letting go of my own normative constructions of learning and teaching. I found you cannot simply remove boundaries in which a person has always lived and expect them to thrive. In the future, perhaps we should use processing to decide together with students which boundaries to remove.

As Giddens (1979) wrote, "social activity is always constituted in three intersecting moments of difference: temporally, paradigmatically (invoking structure which is only present in its instantiation) and spatiality" (p. 54). In our course we were constantly negotiating boundaries around the time the class was held and the time we had to complete activities; the structures we created for students; and the physical and emotional space in which they conducted their work. Giddens (1979) further asserted that "structuring properties providing the binding of time and space in social systems… can be understood as rules and resources, recursively implicated in the reproduction of social systems" (p. 64). Perhaps one possibility of queer pedagogy in practice is to allow teachers and students to consider which rules and boundaries make sense in the moment,

which can be altered, and which can be abandoned all together. As part of this, we can consider what rules have become normative and expected, and what are the implications of this accepted normalcy. These negotiations will never be complete but must be ongoing. Maybe what remains will still be a human desire for structure, but this structure can be recreated and remain flexible to allow for movement and possibilities beyond our imagination.

To answer the last question—How are our own perceptions queered through our work with youth?—I will discuss how my own ideas about my study were queered by the students. I expected the students to gain new ideas about social justice, but did not expect their ideas about learning itself to expand. In this way, my expectations for the structure and boundaries of my study were queered. I could have never imagined that their own conceptions of knowledge would open up in such a way. If I had insisted on my analysis sticking strictly to the literature from my various theoretical frameworks, and only looked for evidence to support the literature, I would not have seen the ways queer pedagogy was enacted.

Queer pedagogy was acting on me and my expectations as a teacher and researcher just as much as I was enacting it through my teaching on the students. A lot of the frustration and worry I experienced throughout the study stemmed from my battle with my own boundaries of what it meant to be a teacher, a researcher, a student, and a learner. This struggle illustrates the difficulty of incorporating queer pedagogy into a K-12 classroom that comes with many internalized, and often unrecognized, boundaries and rules. If it was so difficult for me to embrace queer pedagogy, as a person who wanted to embrace and use it, how are other teachers with less knowledge of the theory to succeed in its incorporation? This relates to the teachers in DePalma's (2010) study who emphasized that they needed to use best practices in their teaching, and it was unlikely that queer pedagogy would fit into this framework. Asking teachers to try

this messy, less-structured method is asking them to take a large risk that will likely cause them more stress than their standard teaching practices. Teachers want to feel confident in their methods so they can focus on student learning, but in *Math for a Cause* this was not always possible. With these dilemmas in mind, I will explore the implications for incorporating the findings from this study in teaching.

Teaching

English Language Arts

This study has given me new ideas for approaching both secondary English classes and English methods. Students in our study had an easier time dissecting and analyzing word-based texts than numerical texts, so I think it is important for English teachers to include numerical literacy in their curriculum. Given the focus on standardized tests in many math classes, which are more about solving math problems than interpreting complex numerical data, this kind of learning would greatly benefit students. It fits in with critical literacy, as it gives students the ability to not just read graphs and understand how they can be manipulated, but to pull out numerical knowledge from a longer text and understand how those numbers are portrayed by an author. By teaching students to read numbers like texts, they can gain a more sophisticated understanding of the world. In turn, I plan on including a discussion and examples of reading numerical texts in English methods classes so that pre-service teachers can plan to include it in their future classrooms. This inclusion can also be supported by the Common Core State Standards that ask students to cite textual evidence to support their analysis (e.g., CCSS.ELA-LITERACY.RI.9-10.1), analyze an author's point of view (e.g., CCSS.ELA-LITERACY.RI.9-10.6), as well as a standard for grades 11 and 12 that specifically asks students to "Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually,

quantitatively) as well as in words in order to address a question or solve a problem" (CCSS.ELA-LITERACY.RI.11-12.7, CCSS, 2015, para. 9). Of course, such standards are decidedly un-queer and problematic.

Additionally, I have learned practical ways to encourage critical thinking with middle school students. Work on critical literacy can be structured to maximize student success. While I tried handouts that had lists of questions that guided students through reading and analyzing an article (see Appendix E), these did not always work as students often ignored their handouts. Likely, this is largely due to the class being an elective, and being held at the end of the day when attention spans were waning. Perhaps earlier in the day or in another class these early handouts would have worked better. When I asked the students to fill out questions in the form of a chart (see Appendix D), this worked better. Students could see all the questions at once and it perhaps was less intimidating in this format. I also learned that I needed to give the students time to reflect throughout each unit, rather than waiting until the end. By the time the students got to the end of a handout or activity (if they even made it that far), they were already feeling overwhelmed by the heavy subject matter. As the course progressed, we started engaging the students in reflective conversations early and often so they could process their feelings with each other (this is evident in Appendix F). This is something I will pass on to pre-service teachers as it is valuable for both critical literacy and social justice pedagogy.

Lastly, this study demonstrated that student talk is often much richer than student work. I would encourage teachers to try to capture this as much as possible. While recording and transcribing all student conversations is impossible, perhaps teachers could make a point to sit in on discussions more often to get a broader sense of students' mindsets. Or, teachers could give student groups audio recorders to capture their discussion. Listening to all of them would not be

necessary; instead teachers could tell their class they would listen to an excerpt of a recording from each group one time per week, so that students would not know which conversation their teacher would hear and hopefully maintain their engagement throughout the week. This would allow teachers to look for evidence of *processing* of the course subjects as well as, or as an alternative to, content mastery. That is, the teachers could learn not only *what* the students are learning, but *how*. Assessments could be done orally as well, to allow students to express their knowledge conversationally rather than in formal writing exercises. This can be difficult in an English classroom where writing is a focus, but teachers could use these conversations to spark reflective writing that comes from students' own interests, which in turn could lead to more formal writing products such as essays or research papers. Abandoning or altering English assessments corresponds with the abandoning closure theme found in the data.

Math

For math teachers, I think this study reinforces that students expect, and so need, a lot of scaffolding for math. They also are not likely retaining all their math skills and need frequent review. Furthermore, it is hard for students to take math from math class and apply it to different contexts. Giving students the opportunity to create and solve their own math problems allows them to practice thinking like a mathematician. They can learn to see math as creative, and hopefully will be able to play with numbers the way they can play with words. While for us that was too high a bar for a trimester-long class, we feel the students at least learned that math was more than a worksheet and they saw the potential for something more creative as they learned to build their own problems. Critical math, like we attempted here, lets students show their own mathematical power as actors rather than spectators.

Math for a Cause can also show math teachers that if you embrace the messiness of social justice in a math classroom you can get unexpectedly delightful results. Skills can then be addressed in the context of students doing math in their projects and/or class activities. Our student did not perhaps learn new mathematical skills, but they did learn that you can use math to draw conclusions and that math is more complicated than a worksheet implies. While the students (and researchers) in *Math for a Cause* felt frustrated at times, from that discomfort came a broader understanding that would have been impossible in a traditional classroom.

Teaching Across the Curriculum

Due to the interdisciplinary nature of *Math for a Cause*, it has many implications for teaching across the curriculum. Teaching in a math classroom was completely foreign to me, and turned out to be a valuable experience. I learned that I am capable of writing lessons and materials outside of my home discipline, even though I frequently tell people I am afraid of math and hate counting. After this course, I can no longer say the former though the latter is still a struggle. But in all seriousness, *Math for a Cause* showed me that it is important as teachers and researchers to work outside of our comfort zones. This highlighted the strengths and weaknesses both of English as a discipline and my own teaching and research practices. I think it was easier for me to create work for students that asked them to embrace ambiguity and ideas that were not concrete because this is typical in an English classroom. As a high school English teacher, I wanted my students to be able to analyze texts in multiple ways, and to see that these multiple interpretations could be supported with evidence. For the math students, especially those who loved math because of rules, this was a difficult concept. Working with Bryan also showed me another side of math—one that allowed for creativity and interpretation—which I thought was only found in humanities subjects.

Partnering with teachers outside of your discipline can create bridges between subjects. It can also show students that the subjects are inter-connected rather than rigidly defined. This border crossing is a queer one, as it shatters the idea that one can be "a math person" or an "English person" and that the two are polar opposites instead of complimentary pieces. By working with other teachers, educators may learn how to create those connections in their classes. Interdisciplinary teaching has been used by social justice educators (North, 2009), has been shown to increase student learning (Jones, 2010), and is cited as helping improve teachers' professional school culture (Sandholtz, 2000). In *Math for a Cause* we could have easily included social studies and technology teachers in our work. Science teachers could have incorporated lessons on how science has been used to categorize social groups in the past, and how that related to the social justice events we studied. I think it is just as important to collaborate as to actually try writing curriculum outside of your discipline. Through your own authentic learning process you may discover new ideas to improve student learning.

Research

There are many possibilities for further exploration of the data from *Math for a Cause.* I am interested in investigating if there was evidence of critical emotional literacy (Zembylas & Vrasidas, 2005). Does queering math for social justice create an increase in critical emotional literacy, collective witnessing, and collective intelligence (Zembylas & Vrasidas, 2005)? Does queering math for social justice come from critical emotional literacy? Can this be found through processing? How are the elements implicated in each other, especially given the school's foundations in Quaker values? I am also interested in conducting more in-depth case studies of each of the focal participants. Additionally, I would like to explore how Sue Denim and Aiden's resistance can be seen as examples of privilege in practice, and further explore how this privilege

hindered their learning. In particular, it would be interesting to explore Sue Denim and Aiden's resistance through the literature on whiteness. When I continue to explore my data beyond this dissertation it is likely more avenues of research will arise.

As stated in my literature review, there are few studies on social justice and queer pedagogies that are focused on student outcomes. More work should be done talking to students and examining their work so the education community can have diverse examples of these pedagogies in action. Talking to teachers who practice social justice is important, but without also talking to their students we have no way of knowing how that practice is being perceived in the classroom. Additionally, more long-term studies would be useful that track students who have had social justice education throughout their schooling experiences. Will the students from our study retain their expanded idea of mathematics and learning, or will it be crushed through the routine of traditional math classrooms? Do students who have a social justice-focused education go on to do activist work in their personal lives? Do they treat their classmates and peers with compassion and care? These are but a few questions that could be asked by longer ethnographies.

I am interested in further exploring queer pedagogy in practice, especially to see if the themes I found in this study, transfer to other contexts. In a pedagogy that eschews normalcy, it would be fitting if each case were particular, though it is likely that some broad commonalities will remain. I would also like to try another queer, social-justice focused course with older students. As Morgan, Bryan and I often wondered, how much of the difficulty students faced was due to their maturity level? If students had been a little older, we may have had different outcomes. Since we originally planned this course with high schoolers in mind, it would be interesting to try it in a secondary school.

Furthermore, Bryan and I originally thought that perhaps it would be easier to teach our course in a private Quaker school than in a public school, but afterwards we reconsidered. Because most of our students had never faced adversity, and were in a school that stressed you should accept everyone, they could not fathom why some people are prejudiced. Perhaps in a traditional school setting with a more diverse population, or in a low-income school, this curriculum would work better because the students would be more likely to know what adversity felt like. In that case, the curriculum could help them work through and discuss issues that they were already familiar with and could enable them to take action that affected them personally.

There is also space to study other Quaker schools and their approach to diversity. As Morgan told me during an interview, The Anchor School was committed to diversity and inclusion in their mission statement, but this was not evident in their practice. I am interested to know if this is typical of other Quaker schools. Are there other models for inclusion that are more successful? Do other Quaker schools focus on community service more than social justice and action? In other schools do students learn the *why* of the Quaker belief system along with the *what*?

Another avenue I would like to explore is methodological. I was surprised and amused that the students were so excited to engage with the audio recorders. When I listened to their conversations each week, I was fascinated with the way they would engage with the recorder as if it were another person. Sometimes that person was me, sometimes it was an imagined audience, and other times it was a creepy spy. As discussed in the processing chapter of my analysis, this interaction depended on their mood and if they were engaged in the material. I would like to research this interaction specifically, both in the existing data and with new participants and contexts. Can audio recorders be used in a way to aid student learning? Can

students use the recorder to explain their learning in a way that is different from writing their answers? How can this engaged play be harnessed by a teacher, without losing the spontaneity that seemed to make it thrive?

Morgan and The Anchor School

While this study has given me many ideas for future teaching and research possibilities, it also had an immediate effect on Morgan, our collaborating teacher. Morgan was already planning a class for seventh grade students on identity and our work with *Math for a Cause* informed how she shaped it. In talking about her identity course, Morgan said:

> The thing that it [Math for a Cause] did help me realize is just kind of the place where the kids are at just in terms of talking about other, you know, like I say we talk about LGBTQ issues a lot, and we don't talk about a lot of other social injustices. And I've been pushing for a class that I want to start with the 3rd year kids [seventh grade] about identity, and who they are and how that relates to the world … I'm teaching it as an elective just to try to try out some curriculum and see how it goes. And I'm doing it [next] trimester. And so [our] class helped me see kind of what middle schoolers are ready to start talking about, and how to ease into it a little bit more. And they want to talk about personal things. And how to connect it to the personal…. So now that I have that experience behind me, you know as soon as we were done with that activity [on racial representation in prisons, see discussion in Chapter 6] I was like OK wow, we probably should have done this differently. But … with this identity class, now I can really scaffold it a little bit more. And get them there eventually, maybe, but there are steps along the way, you know. (personal communication, Nov. 18, 2014).

While Morgan hoped that hew new class will allow the students to engage in in-depth discussions of identity markers like race and gender, through our experiences in *Math for a Cause* she learned that diving immediately into that would not be possible. Instead, she planned to start slower, with students looking inward and reflecting on their own experiences first.

Morgan's motivation for her identity class is related to her frustration with the school's community service program. She and another teacher were working on restructuring the way the school approaches community service, to connect it more to student interests, integrate it into the

curriculum, and make it about more than privileged kids going to the outside world to help out for a day without being impacted by the experience. As she described,

> what can happen here [at The Anchor School] is that we can just get really self-righteous, and we can think 'oh we're progressive, and we're aware, and we want things to be better' you know. And, and we just kind of rest on that and don't think there's anything else to do" (personal communication, Nov. 18, 2014).

Morgan's statement illustrates that practice is more important than policy. It is Morgan's hope that The Anchor School will stop resting on their mission, and instead work to practice their mission by purposefully recruiting and retaining a more diverse student body and staff.

Math for a Cause's Queer Futurity

If I were to teach *Math for a Cause* again, I would make several changes. One would be to collaborate with a school librarian. Much of the challenges the students faced were related to finding and sorting through information. If the trimester were longer or the course not an elective, I would have incorporated this in the original design, and not including it hindered the students' ability to successfully mine information to find what they needed to create and complete their math problems. Another practical change is to have more support in choosing articles for the students to read. As previously stated, I was not always successful at judging if the reading level was appropriate for middle school students. It would also be interesting to plan the course so that student groups could end their units at different times to allow for different work paces. In this course, we stopped a unit when the majority were finished and we had the sense that it was time to move on. I'm not sure how I could do this differently, but perhaps instead of whole-class discussions on the topics there could be weekly whole-class check-ins and sharing times so that groups could report where they were at the moment without needing to feel they were giving a final report. Lastly, I would perhaps have more scaffolding in the beginning of the course, rather than having the students freely research from the beginning. However, I

remain unsure about this as the struggle and discomfort led to learning. If we had more traditionally-scaffolded lessons at the start, would the outcomes have been the same? There is no way of knowing.

Beyond the immediate significance of Morgan's work at The Anchor School, this study has the potential to impact queer pedagogy, English methods, teaching across the curriculum, and social justice pedagogy. The study shows that queer pedagogy can be enacted by students through processing, a finding missing from current work. It adds to the literature on social justice education in practice, and shows that middle school students are interested in these topics and can engage in difficult conversations despite occasional confusion and frustration. It shows that students can learn to let go of having only one right answer, even students for whom finding that one answer was why they were interested in a subject like math. *Math for a Cause* shows that researchers can be queered by their own work, and that this queering can lead to unexpected pleasures. It is my hope that this study can lead to multiple possibilities on the horizon of queer pedagogy.

APPENDIX A

13-2911 Focus Group Guide

We will conduct small focus groups with 2-3 students to see what social justice issues interest them. We will ask questions to the group, not to students individually. Due to the nature of qualitative research, these questions may vary according to the flow of the conversation.

Possible questions include, but are not limited to:

1. What do you think social justice means?
    a. If they are unsure, we will tell them that it is based on the ideas of human rights and equality for all people.
2. What are the social justice issues you or your school club is interested in?
3. Why do you think these issues are important?
4. What do you think people can do to solve these problems?
5. If you took a class based on social justice issues, which issues do you think would be most interesting or important for the teacher to focus on?
6. Do you have an idea of the kind of math you would need to address or solve these problems?
7. What kinds of math classes or experiences have you had?

APPENDIX B

Mathematics For A Cause
Pre-Survey

1. Why were you interested in taking a course called “Math for a Cause”?

2. Did the Mathematics focus make the class more appealing or less appealing to you? Why or why Not?

3. What sorts of Mathematics courses have you taken in the past?
    a. Do you feel you have been successful in these courses?
    b. Do you enjoy mathematics?
    c. Do you feel that you are good at mathematics?
    d. What does it mean to be “good” at mathematics?

4. What sorts of “causes” do you think might be able to be addressed through mathematics?
    a. What sorts of mathematics might you need to address that particular problem?

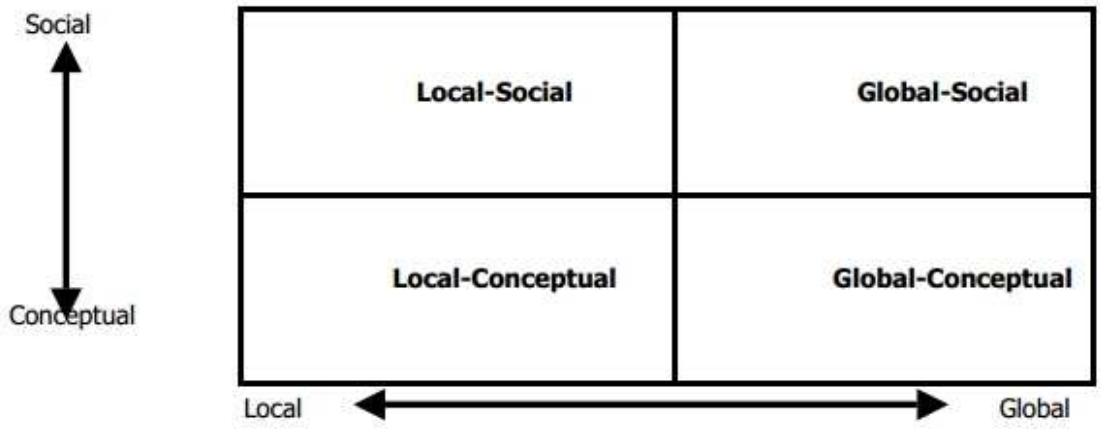
5. Describe “Social Justice” in your own words:

6. Describe a time when you witnessed inequality or unfairness in your everyday life:
    a. How did that make you feel?
    b. What sorts of actions did you take (or do you wish you had taken)?

7. Below is a social justice leadership matrix. It shows two types of leaders: social and conceptual, and distinguishes between global (leading people worldwide) and local (leading people in a town, county, state, etc.). A **social leader** is a person who is directly involved with other people. A **conceptual leader** is someone whose ideas- whether in writing, or other forms of media- inspires change in people. A person may be both a social and conceptual leader: for example, Dr. Martin Luther King, Jr. was a social leader during his lifetime as he worked with people during the civil rights movement. He was, and continues to be, a conceptual leader as his writing has influenced many people.

Draw a **circle** indicating where you see yourself in relation to the matrix. Draw an **X** where you would like to be. Write a brief explanation below explaining your choices.

Figure 1



APPENDIX C

Post-course survey

Please answer these questions thoughtfully and carefully.

1. What was your favorite thing in this class?

2. What challenged you most in this class?

3. What do you feel most proud of?

4. What does this class mean to you?

5. How do you feel about the class?

6. Describe social justice in your own words:

7. How do you feel about social justice?

8. Describe what it means to “do math”:

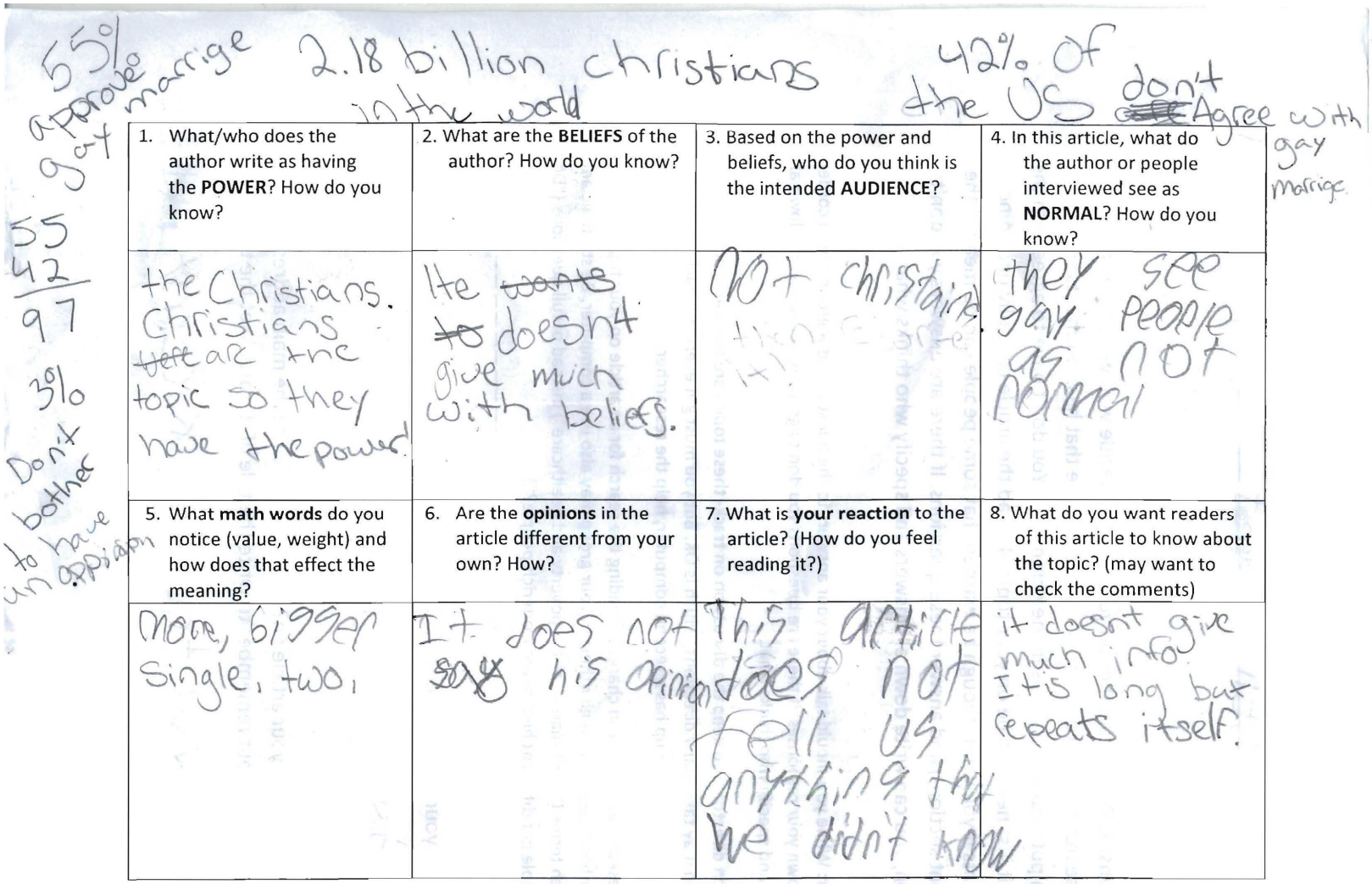
9. How do you feel about math?

10. Draw a picture of something meaningful to you from this class:

11. Explain your drawing:

APPENDIX D

Ashley, Justin Case, and Sum Dood's literacy handout from their first article, *Why So Many Christians Won't Back Down on Gay Marriage* (Gobry, 2014)



55% approve gay marrige

2.18 billion christians in the world

42% of the US don't Agree with gay marrige

55
42
97

3%
Don't bother to have an opinion

1. What/who does the author write as having the **POWER**? How do you know?	2. What are the **BELIEFS** of the author? How do you know?	3. Based on the power and beliefs, who do you think is the intended **AUDIENCE**?	4. In this article, what do the author or people interviewed see as **NORMAL**? How do you know?
the Christians. Christians ~~left~~ are the topic so they have the power	He ~~wants~~ ~~to~~ doesn't give much with beliefs.	not christains	they see gay people as not normal
5. What math words do you notice (value, weight) and how does that effect the meaning?	**6. Are the opinions in the article different from your own? How?**	**7. What is your reaction to the article? (How do you feel reading it?)**	**8. What do you want readers of this article to know about the topic? (may want to check the comments)**
more, bigger single, two,	It does not ~~say~~ his opinion	This article does not tell us anything that we didn't know	it doesn't give much info It is long but repeats itself.

Ashley, Justin Case, and Sum Dood's literacy handout from their second article

Names _____ Date _____

Article title 10 Reasons why Homosexual Marriage is Harmful

Directions: 1) decide together on your topic 2) decide who will complete each role 3) search for an article online- try to find one that has comments so later you can put your calculations in the comments. You don't have to agree with the article, it just needs to be on your topic. 4) read the article carefully (including comments if you want- though be warned that some people can be mean in the comment section!) and answer these questions. If there are answers you don't agree on, you can write down all answers and specify who thinks what.

Must be opposed

Roles:

Recorder: While you should talk about your answers to the questions as a group, the recorder writes down your responses. If there are questions you don't agree on, you can write down all answers and specify who thinks what.

Discussion director: You keep the discussion on track- these topics are complex and your discussion may take many directions, which is OK. But you must get everyone back on point if it strays too far. If your group has a second computer, help the researcher.

Online researcher: You are in charge of leading the search for an article on your topic choice and for other research, though others in your group may also use a computer. Be strategic and use search terms ("LGBT marriage" or "poverty and healthcare") instead of full questions ("Do poor people get different healthcare from rich people?")

---

1. What is your social justice topic?

   Marriage Equality

2. What website is your article on? Here you can write the main address only, like www.cnn.com, but remember to write the title of the article at the top of the page.

   www.tfpstudentaction.org

www.christianitytoday.com
gay x14 homosexual = 2x Marriage = x19
3 page "Marriage" = x0

1. What/who does the author write as having the **POWER**? How do you know?	2. What are the **BELIEFS** of the author? How do you know?	3. Based on the power and beliefs, who do you think is the intended **AUDIENCE**?	4. In this article, what do the author or people interviewed see as **NORMAL**? How do you know?
the Christians, it believes it offends god and it "violates natural law."	Antigay and a strong believer in the bible.	anyone that looks it up online! Christian/ Antigay/students	NO GAYS Christians
5. What math words do you notice (value, weight) and how does that effect the meaning?	**6. Are the opinions** in the article different from your own? How?	**7. What is your reaction** to the article? (How do you feel reading it?)	**8. What do you want readers of this article to know about the topic?** (may want to check the comments)
"Homosexual" 25 times "gay" 12 times and "Marriage" 12 time	YES! We believe in and support gay marriage (unlike the Haters.)	it is very rude and we don't agree with it. (commenting on Antigay comments)	in our oppinion this article is incorrect and the oppinions of the Author are WRONG

x4 gay in actual writing
homosexual x26

APPENDIX E

Names _____ Date _____

Directions: Read the roles below, and with your group decide who will do what. Read your group's article carefully, and answer the 6 questions.

Roles:

Recorder: While you should talk about your answers to the questions as a group, the recorder writes down your responses. If there are questions you don't agree on, you can write down all answers and specify who thinks what.

Navigator: You keep the discussion on track- these topics are complex and your discussion may take many directions, which is OK. But the navigator must get everyone back on point if it strays too far.

Highlighter: When your group is answering the questions, look through the article to find specific words, sentences, or impressions you get from the article that justify your groups' answers. Let the recorder know so they can include examples in your answers. (If the example is long, just explain where to find it like "3rd paragraph.")

Write article title here: _____

1. In your own words, sum up this article in 2-3 sentences:

2. What do you think is the author's purpose for writing this, and why do you think so?

3. Who do you think is the audience for this article, and why?

4. What math do you see in the article? Or, what kind of math would help you understand the article better, or show a different point of view? You do not need to do calculations yet, just describe the type of problems you see the potential for, being as detailed as possible.

5. What questions do you have for the class that would help you understand this article and/or issue better?

APPENDIX F

Math for a Cause – Percentage Warm-Up 10/14

1) The United States is 5% of the world population. The World population is 7.125 billion. About how many people are in the United States?

2) Even though the United States is only 5% of the World population, we have 25% of world prisoners. If there are about 9 million prisoners in the world, how many prisoners are in the US?

3) What conclusions can you make based on this math?

There are about 316.1 million people in the US.

4) If 12.6% of the US population are African American, about how many African Americans are there in the US?

5) If 17% of the US population are Hispanic, about how many Hispanic people are there in the US?

6) In 2008, African Americans and Hispanics made up 58% of all prisoners in the US. If there are 2,266,800 people in prison in the US, how many of them are African American and Hispanic?

7) What conclusions can you make based on this math?

APPENDIX G

If you're participating in the research study, please fill out this questionnaire. Check the box to the left of the choices that describe you.

Fake name _____

1. Age _____
2. Grade: ☐ 1st year (5th) ☐ 2nd year (6th) ☐ 3rd year (7th)
3. Legal sex (what it says on your birth certificate/ school forms):

☐ Female ☐ Male

4. Gender identity: ☐ female/girl ☐ male/boy ☐ trans*/transgender

   ☐ None of these describe me, I like _____

5. I am (check all that apply):

   ☐ African-American ☐ Asian/Pacific Islander ☐ Hispanic/ Latina/o

   ☐ Native American/ Alaskan Native ☐ White

6. How many years have you been at this school? Include elementary school.

Marriage Equality Math!

Recently, marriage equality finally came to North Carolina! Now same-sex couples have the right to get legally married.

1) A marriage license in North Carolina costs $60 per couple. When the Durham County courthouse opened Monday, October 13th, 15 same-sex couples were waiting to get their license. How much money did the couples spend that morning on licenses?

2) Durham county Register of Deeds (responsible for processing marriage licenses) said that normally the office processes between 12-15 marriage license applications per day. But on October 13th, the office processed around 50. Estimate how many of these applications were from same-sex couples:

3) Using your above estimate, calculate the percentage of marriage license applications from same-sex couples in Durham on Monday, October 13th.

4) What is your reaction to these numbers? (More questions on the back!)

5) A recent report, using the 2010 census, shows that there are 18,309 same-sex couples in North Carolina. The report also estimates that 50% of these couples, or 9,155, would

choose to marry in the next three years. How much money would these couples spend on marriage licenses?

6) Given these numbers, how do you think same-sex marriage will affect the state's economy?

7) People spend money on things other than licenses when they get married. List 3 other potential wedding expenses:

8) Choose one of your expenses above, and find a vendor/company in NC (be sure to pick one that lists prices on their website!):

Vendor _____

Service provided _____

Cost _____

9) If all 15 couples who got their marriage license early on Oct. 13 used this vendor, how much money would they spend?

10) What is your reaction to this subject, and the numbers you discovered?

APPENDIX I

www.marriageequality.org

1. What do you want your math problem to focus on? Give a specific example from your article. Just writing "education" or "marriage equality" is too big- find something specific and related to social justice.

2. What information do you need for your math problem? Statistics, opinion polls, etc.?

3. What **social justice** question(s) is your math problem going to answer? (Examples: Are poor people targeted more than wealthy people in environmental regulations? Are areas with mostly white populations given more funding for schools than areas populated mostly by people of color?)

4. Write your math problem here. **Show one of us before you start working**. Use notebook paper to show your calculations.

REFERENCES

Adair, J. K. (2008). Everywhere in life there are numbers: Questions for social justice educators in mathematics and everywhere else. *Journal of Teacher Education, 59*(5), 408-415.

Anzaldúa, G. (1987). *Bordelands/La frontera*. San Francisco, CA: Aunt Lute.

Anzaldúa, G. (1990). *Making face, making soul/haciendo caras: Creative and critical perspectives by feminists of color*. San Francisco, CA: Aunt Lute Books.

Applebee, A. N., Langer J. A., Nystrand M., & Gamoran, A. (2003). Discussion-based approaches to developing understanding: Classroom instruction and student performance in middle and high school English. *American Educational Research Journal, 40*(3), 685-730.

Albers, P., Vasquez, V. & Harste, J. (2011). Making visual analysis critical. In D. Lapp & D. Fisher (Eds.) *Handbook of research on teaching the English language arts* (3rd ed.) (pp. 195-201). New York, NY: Routledge.

Ashcraft, C. (2012). But how do we talk about it?: Critical literacy practices for addressing sexuality with youth. *Curriculum Inquiry, 42*(5), 597-628.

Aslan Tutak, F., Bondy, E., & Adams, T. L. (2011). Critical pedagogy for critical mathematics education. *International Journal of Mathematical Education in Science & Technology, 42*(1), 65-74.

Associated Press. (2014, Oct. 6). Berger, Tillis vow to defend NC ban on gay marriage. *WCN*. http://www.wncn.com/story/26714630/nc-gay-marriage-proponents-to-move-to-overturn-ban.

Aukerman, M. (2012). "Why Do You Say Yes to Pedro, but No to Me?" Toward a Critical Literacy of Dialogic Engagement. *Theory Into Practice, 51*(1), 42-48.

Ayers, W. (1998). Foreword: Popular education- Teaching for social justice. In W. Ayers, J. A. Hunt, and T. Quinn, (Eds.) *Teaching for social justice: A democracy and education reader* (pp. xvii-xxv). New York, NY: W. W. Norton.

Bakhtin, M. (1981). *The dialogic imagination: Four essays.* Austin, TX: University of Texas Press.

Banks, W. P. (2009). Literacy, sexuality, and the value(s) of queer young adult literatures. *English Journal, 98*(4), 33-36.

Bartell, T. (2013). Learning to teach mathematics for social justice: Negotiating social justice and mathematical goals. *Journal for Research in Mathematics Education, 44*(1), 129-163.

Beach, R. & Lundell, D. (1998). Early adolescents' use of computer-mediated communication in writing and reading. In D. Reinking, M. C. McKenna, L. D. Labbo, & R. D. Kieffer's (Eds). *Handbook of literacy and technology: Transformations in a post-typographic world*, (pp. 93-112). Mahwah, NJ: L. Erlbaum Associates.

Bean, T. W., & Moni, K. (2003). Developing students' critical literacy: Exploring identity construction in young adult fiction. *Journal of Adolescent and Adult Literacy, 46*(8), 638-653.

Behar, R. (1996). *The vulnerable observer: Anthropology that breaks your heart*. Boston, MA: Beacon Press.

Behrman, E. H. (2006). Teaching about language, power, and text: A review of classroom practices that support critical literacy. *Journal of Adolescent & Adult Literacy, 49*(6), 490-498.

Beliveau, L. B., Holzer, K. O., & Schmidt, S. (2008). It's in the telling and the sharing: Becoming conscious of social justice through communal exploration. In s. j. Miller, L. B. Beliveau, T. DeStigter, D. Kirkland & P. Rice (Eds.), *Narratives of social justice teaching: how English teachers negotiate theory and practice between preservice and inservice spaces* (Vol. 332) (pp. 23-44). New York, NY: Peter Lang.

Bell, L. A. (1997). Theoretical foundations for social justice education. In M. Adams, L. A. Bell, & P. Griffith (Eds.), *Teaching for diversity and social justice* (pp. 3-15). New York, NY: Routledge.

Bender-Slack, D. (2010). Texts, talk...and fear? English language arts teachers negotiate social justice teaching. *English Education*, 181-203.

Bernard Martin, D. & McGee, E. (2009). Mathematics literacy and liberation: Reframing mathematics education for African-American children. In B. Greer, S. Mukhopadhyay, A. B. Powell, & S. Nelson-Barber (Eds.), *Culturally responsive mathematics education* (pp. 207-238). New York, NY: Routledge.

Bigelow, B. (1998). The human lives behind the labels: The global sweatshop, Nike, and the race to the bottom. In W. Ayers, J. A. Hunt, and T. Quinn, (Eds.) *Teaching for social justice: A democracy and education reader* (pp. 21-38). New York, NY: Teachers College Press, The New Press.

Birkel, M. L. (2004). *Silence and witness: The Quaker tradition*. Maryknoll, NY: Orbis Books.

Black, R. (2013). Language, culture and identity in fan fiction. In C. Lankshear & M. Knobel (Eds.), *A new literacies reader: Educational perspectives* (pp. 229-246). New York, NY: Peter Lang.

Black, R. W. & Steinkuelher, C. (2009). Literacy in virtual worlds. In L. Christenbury, R. Bomer, & P. Smagorinsky (Eds.), *Handbook of adolescent literacy research* (pp. 271-286). New York, NY: Guilford Press.

Bleicher, R. (2008). Internet pedagogy: Using the internet to achieve student learning outcomes. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 1093-1107). New York, NY: Lawrence Erlbaum Associates/Taylor & Francis Group.

Blount, J. and Anahita, S. (2004). The historical regulation of sexuality and gender of students and teachers: An intertwined legacy. In L. E. Rasmussen, S. Rofes & S. Talburt (Eds.), *Youth and sexualities: Pleasure, subversion, and insubordination in and out of schools* (pp. 63-84). New York, NY: Palgrave Macmillan.

Boellstorff, T. (2003). Dubbing culture: Indonesian gay and lesbi subjectivities and ethnography in an already globalized world. *American Ethnologist, 30*(2), 225-242.

boyd, d. (2014). *It's complicated: The social lives of networked teen*s. New Haven, CT: Yale University Press.

Bowers-Campbell, J. (2011). Take it out of class: Exploring virtual literature circles. *Journal of Adolescent & Adult Literacy*, *54*(8), 557-567.

Boyles, D., Carusi, T., & Attick, D. (2009). Historical and critical interpretations of social justice. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* [electronic version] (pp. 30-42). New York, NY: Routledge.

Bradney, A., & Cownie, F. (2000). *Living Without Law: An Ethnography of Quaker Decision-making, Dispute Avoidance, and Dispute Resolution*. Sudbury, MA: Dartmouth Publishing Company.

Brantlinger, A. (2013). Between Politics and Equations: Teaching Critical Mathematics in a Remedial Secondary Classroom. *American Educational Research Journal, 50*(5), 1050-1080.

Brion-Meisels, G. (2009). Playing in the light: Experiential learning and white identity development. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* (pp. 661-667). New York, NY: Routledge.

Britzman, D. (1995a). Is there a queer pedagogy? Or stop reading straight. *Educational Theory, 45*(2), 151-165.

Britzman, D. (1995b). "The question of belief": Writing poststructural ethnography. *International Journal of Qualitative Studies in Education, 8*(3), 229-238.

Britzman, D. (2012). Queer pedagogy and its strange techniques. In E. Meiners & T. Quinn (Eds.) *Sexualities in Education: A reader* (pp. 292-308). New York, NY: Peter Lang Publishing.

Britzman, D., & Gilbert, J. (2004). What will have been said about gayness in teacher education. *Teaching Education, 15*(1), 81-96.

Browne, K. & Nash, C. (2010). *Queer methods and methodologies: Intersecting queer theories and social science research*. Farnham, Surrey, England ;Burlington, VT: Ashgate.

Bruce, D. (2009). Reading and writing video: Media literacy and adolescents. In L. Christenbury, R. Bomer, & P. Smagorinsky (Eds.), *Handbook of adolescent literacy research* (pp. 287-304). New York, NY: Guilford Press.

Bruce, H. (2013). Subversive Acts of Revision: Writing and Justice. *English Journal, 102*(6), 31-39.

Bryson, M., & de Castell, S. (1993). Queer pedagogy: Praxis makes im/perfect. *Canadian Journal of Education/Revue canadienne de l'education, 18*(3), 285-305.

Butler, J. (2004). *Undoing gender*. New York, NY: Routledge.

Camangian, P. (2009). Real talk: Transformative English teaching and urban youth. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* [electronic version] (pp. 437-507). New York, NY: Routledge.

Cammarota, J., & Romero, A. (2011). Participatory action research for high school students: Transforming policy, practice, and the personal with social justice education. *Educational Policy, 25*(3), 488-506.

Carnevale, A. P., & Desrochers, D. M. (2003). The democratization of mathematics. In B. Madison and L. Steen (Eds.), *Quantitative literacy: Why numeracy matters for schools and colleges* (pp. 21-31). Princeton, NJ: Woodrow Wilson Natl Foundation.

Carrette, J. R., & King, R. (2005). *Selling spirituality: The silent takeover of religion*. Florence, KY: Psychology Press.

Casey, G. (2013). Interdisciplinary literacy through social media in the mathematics classroom: An action research study. *Journal of Adolescent & Adult Literacy, 57*(1), 60-71.

Chapman, T. K., Hobbel, N., & Alvarado, N. V. (2011). A social justice approach as a base for teaching writing. *Journal of Adolescent & Adult Literacy, 54*(7), 539-541.

Christensen, L. (1998). Writing the word and the world. In W. Ayers, J. A. Hunt, and T. Quinn, (Eds.), *Teaching for social justice: A democracy and education reader* (pp. 39-47). New York, NY: Teachers College Press, The New Press.

Coffey, A., & Atkinson, P. (1996). *Making sense of qualitative data: complementary research strategies.* Thousand Oaks, CA: Sage Publications.

Coiro, J., Knobel, M., Lankshear, C., Leu, D. (2008). Central issues in new literacies and new literacies research. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 1-22). New York, NY: Lawrence Erlbaum Associates/Taylor & Francis Group.

Collins, S. (2008). *The hunger games* (1st Ed.). New York, NY: Scholastic Press.

Common Core State Standards Initiative. (2014). Common Core State Standards for mathematics. Retrieved from http://www.corestandards.org/.

Copenhaver-Johnson, J. F. (2010). Learning about heterosexism as a teacher educator: The

Resistant student as catalyst for change. In M. Blackburn, C. Clark, L. Kenney, & J. Smith (Eds.), *Acting out!: Combating homophobia through teacher activism* (pp. 17-36). New York, NY: Teachers College Press.

Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. *Stanford Law Review, 43*(6), 1241-1299.

Cruz, C. (2008). Notes on immigration, youth, and ethnographic silence. *Theory Into Practice 47*(1), 67–73.

Dalton, W., Hackney, J., & Perdue, B. (2009). *North Carolina Law on Bullying/NC School Violence Prevention Act*. General Assembly of North Carolina, Session 2009. Retrieved from http://www.ncga.state.nc.us/sessions/2009/bills/senate/pdf/s526v5.pdf.

Danesi, M. (2014). The symbolism of *cool* in adolescence and youth culture. In A. Ibrahim & S. Steinberg (Eds.), *Critical Youth Studies Reader* (pp. 38-46). New York, NY: Peter Lang.

Daniel, M. F., Lafortune, L., Pallascio, R., Spliter, S., Slade, C., & de la Garza, T. (2005). Modelling the development process of dialogical critical thinking in pupils aged 10 to 12 years. *Communication Education, 54*(4), 334-354.

Davies, J. (2009). A space for play: Crossing boundaries and learning online. In V. Carrington, & M. Robinson (Eds.), *Digital literacies: Social learning and classroom practices* (pp. 27-42). Los Angeles, CA: Sage.

Davies, J. & Merchant, G. (2009). Negotiating the blogosphere: Educational possibilities. In V. Carrington, & M. Robinson (Eds.), *Digital literacies: Social learning and classroom practices* (pp. 81-92). Los Angeles, CA: Sage.

de Freitas, E. (2008). Troubling teacher identity: Preparing mathematics teachers to teach for diversity. *Teaching Education, 19*(1), 43-55.

Denzin, N. K. (1970). *The Research Act in Sociology.* Chicago, IL: Aldine.

Denzin, N. K. & Lincoln, Y. S. (2005). *The SAGE handbook of qualitative research* (3rd ed.). Thousand Oaks, CA: Sage Publications.

DePalma, R. (2010). The no outsiders project: In search of queer primary pedagogies. *Transformations: The Journal of Inclusive Scholarship & Pedagogy, 21*(2), 47-58.

Depasquale, J. (2009). Working within and against heterosexist and homophobic schools: Social justice and high school journalism. In R. Rogers, M. A. Kramer, M. Mosley & Literacy for Social Justice Teacher Research Group (Eds.), *Designing socially just learning communities: Critical literacy education across the lifespan* (pp. 159-170). New York, NY: Routledge.

Detamore, M. (2010). Queer(y)ing the ethics of research methods: Towards a politics of intimacy in researcher/researched relations. In K. Browne & C. Nash (Eds.), *Queer methods and methodologies: Intersecting queer theories and social science research* (pp. 67-182). Farnham, Surrey, England; Burlington, VT: Ashgate.

Dowdall, C. (2009). Masters and critics: Children as producers of online digital texts. In V. Carrington, & M. Robinson (Eds.), *Digital literacies: Social learning and classroom practices* (pp. 43-64). Los Angeles, CA: Sage.

Ellis, V. (2009). What English Can Contribute to Understanding Sexual Identities. *English Journal, 98*(4), 52-55.

Erstad, O. (2013). Trajectories of Remixing: Digital literacies, media production, and schooling. In C. Lankshear & M. Knobel (Eds.), *A new literacies reader: Educational perspectives* (pp. 38-56). New York, NY: Peter Lang.

Esmonde, I. (2009). Ideas and identities: Supporting equity in cooperative mathematics learning. *Review of Educational Research*, *79*(2), 1008-1043.

Eugenides, J. (2002). *Middlesex* (1st ed.). New York, NY: Farrar, Straus and Giroux.

Fabos, B. (2008). The price of information; Critical literacy, education, and today's Internet. In D. J. Leu, J. Coiro, M. Knobel, & C. Lankshear (Eds.), *Handbook of research on new literacies* (pp. 839-870). Mahwah, NJ: Erlbaum.

Ferfolja, T. & Robinson, K. H. (2004). Why anti-homophobia education in teacher education? Perspectives from Australian teacher educators. *Teaching Education, 15*(1), 9-25.

Frankenstein, M. (2005). Reading the world with math. In Gutstein, E., & Peterson, B. (Eds.), Rethinking mathematics: Teaching social justice by the numbers, (pp. 19-28). Milwaukee, WI: Rethinking Schools.

Freebody, P., & Luke, A. (1990). Literacies programs: Debates and demands in cultural context. *Prospect: Australian Journal of TESOL, 5*(7), 7-16.

Freire, P. (2000). *Pedagogy of the oppressed*. (30th anniversary Ed.). New York, NY: Continuum.

Gee, J. P. (2007). *What video games have to teach us about learning and literacy* (Rev. and updated ed.). New York, NY: Palgrave Macmillan.

Gee, J. P. (2012). *Social linguistics and literacies: Ideology in discourses* (4th ed.). Abingdon, Oxon; New York, NY: Routledge.

Geertz, C. (1973). *The interpretation of cultures: Selected essays* (Vol. 5019). New York, NY: Basic books.

Gilgun, J. (2005). Qualitative research and family psychology. *Journal of Family Psychology, 19*(1), 40-50.

Glazer, E. (2001). *Using Internet primary sources to teach critical thinking skills in mathematics*. Westport, CT.: Greenwood Press.

Gobry, P.-E. (2014, Sept. 3). Why so many Christians won't back down on gay marriage. *The Week*. Retrieved from http://theweek.com/articles/444138/why-many-christians-wont-back-down-gay-marriage.

Goldstein, T., Russell, V., & Daley, A. (2007). Safe, positive and queering moments in teaching education and schooling: A conceptual framework. *Teaching Education, 18*(3), 183-199.

Goodall, H. (2000). *Writing the new ethnography.* Walnut Creek, MD: AltaMira Press.

Gorman-Murray, A., Johnston, L & Waitt, G. (2010). Queer(ing) communication in research relationships: A conversation about subjectivities, methodologies, and ethics. In K. Browne & C. Nash (Eds.), *Queer methods and methodologies: Intersecting queer theories and social science research* (pp. 97-112). Farnham, Surrey, England; Burlington, VT: Ashgate.

Grant, C. A., & Agosto, V. (2008). Teacher capacity and social justice in teacher education. In M. Cochran-Smith, S. Feiman-Nemser, D. J. McIntyre & K. E. Demers (Eds.) *Handbook of research on teacher education: Enduring questions in changing contexts* (pp. 1175-1198). New York, NY: Routledge.

Greene, M. (1998). Introduction: Teaching for social justice. In W. Ayers, J. A. Hunt, and T. Quinn, (Eds.) *Teaching for social justice: A democracy and education reader* (pp. xvii-xivi). New York, NY: W. W. Norton.

Gregson, S. A. (2013). Negotiating Social Justice Teaching: One Full-Time Teacher's Practice Viewed from the Trenches. *Journal for Research in Mathematics Education, 44*(1), 164-198.

Groenke, S. L. (2008). Missed opportunities in cyberspace: Preparing preservice teachers to facilitate critical talk about literature through computer-mediated communication. *Journal of Adolescent & Adult Literacy, 52*(3), 224-233.

Gustavson, L. (2013). Influencing pedagogy through the creative practices of youth. In C. Lankshear & M. Knobel (Eds.), *A new literacies reader: Educational perspectives* (pp. 229-246). New York, NY: Peter Lang.

Gutiérrez, L. A. (2014). Youth Social Justice Engagement in the Face of Anti-Latina/o immigrant Illegitimacy. *The Urban Review, 46*(2), 307-323.

Gutierrez, R. (2002). Enabling the practice of mathematics teachers in context: Toward a new equity research agenda. *Mathematical Thinking and Learning, 4*(2-3), 145-187.

Gutiérrez, R. (2010). The sociopolitical turn in mathematics education. *Journal for Research in Mathematics Education, 41*, 1-32.

Gutstein, E. (2003). Teaching and learning mathematics for social justice in an urban, Latino school. *Journal for Research in Mathematics Education, 34*(1), 37-73.

Gutstein, E. (2007). Connecting community, critical, and classical knowledge in teaching mathematics for social justice. *The Montana Mathematics Enthusiast, 1*, 109-118.

Gutstein, R. (2009). Developing social justice mathematics curriculum from students' realities: A case of a Chicago public school. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* (pp. 690-698). New York, NY: Routledge.

Gutstein, E., Lipman, P., Hernandez, P., & de los Reyes, R. (1997). Culturally relevant mathematics teaching in a Mexican American context. *Journal for Research in Mathematics Education*, *28*(6), 709-737.

Gutstein, E., & Peterson, B. (2005). *Rethinking Mathematics: Teaching Social Justice by the Numbers*. Milwaukee, WI: Rethinking Schools, Ltd..

Hagood, M. C., Skinner, E. N., Venters, M., Yelm, B. (2013). New literacies and assessments in middle school social studies content area instruction: Issues for classroom practices. In C. Lankshear & M. Knobel (Eds.), *A new literacies reader: Educational perspectives* (pp. 212-226). New York, NY: Peter Lang.

Halberstam, J. (2011). *The queer art of failure*. Durham, N.C.: Duke University Press.

Hand, V. (2012). Seeing culture and power in mathematical learning: Toward a model of equitable instruction. *Educational Studies in Mathematics, 80*(1-2), 233-247.

Harris, S. (1990). *Lesbian and gay issues in the English classroom: The importance of being honest.* Milton Keynes: Open University Press.

Hayden-Benn, J. (2011). Creating critical activists rather than robots of hegemony: A grade six social justice club. *Radical Teacher, 91*, 50-58.

Heffernan, L. (2004). *Critical literacy and writer's workshop: Bringing purpose and passion to student writing*. Newark, DE: International Reading Association.

Hermann-Wilmarth, J & Bills, P. (2010). Identity shifts: Queering teacher education research. *The Teacher Educator, 45*, 257-272.

Hines, M. B., & Johnson, J. (2007). Teachers and students as agents of change: Toward a taxonomy of the literacies of social justice. In *2007 Yearbook of the National Reading Conference.* Oak Creek, WI: National Reading Conference.

Hobson, S. (2009). Learning to listen: Creating socially just curricula for middle and high school students. In R. Rogers, M. A. Kramer, M. Mosley & Literacy for Social Justice Teacher Research Group (Eds.), *Designing socially just learning communities: Critical literacy education across the lifespan* (pp. 65-75). New York, NY: Routledge.

Howe, C., & Abedin, M. (2013). Classroom Dialogue: A Systematic Review across Four Decades of Research. *Cambridge Journal of Education, 43*(3), 325-356.

Huitt, W. (2003). The information processing approach to cognition. *Educational Psychology Interactive.* Valdosta, GA: Valdosta State University. Retrieved from http://www.edpsycinteractive.org/topics/cognition/infoproc.html.

Huizinga, J. (1955). *Homo ludens: A study of the play-element in culture*. Boston, MA: Beacon Press.

Hutchinson, J. N. & Romano R. M. (1998). A story for social justice. In W. Ayers, J. A. Hunt, and T. Quinn (Eds.), *Teaching for social justice: A democracy and education reader* (pp. 254-269). New York, NY: Teachers College Press, The New Press.

Hytten, K. (2004). Postcritical ethnography: Research as a pedagogical encounter. In G.W. Noblit, S. Y. Flores, S.Y. & E. G. Murillo (Eds.), *Postcritical ethnography: Reinscribing critique* (pp. 95-105). Cresskill, NJ: Hampton Press.

Hytten, K. (2008). Critical thinking, social justice, and the role of philosophy. In J. Diem and R. Helfenbein (Eds.), *Unsettling beliefs: Teaching theory to teachers* (pp. 185-2000). Charlotte, NC: Information Age Publishing, Inc.

Hytten, K., & Bettez, S. C. (2011). Understanding education for social justice. *Educational Foundations, 25*(1/2), 7-24.

Jackson, A. Y., & Mazzei, L. A. (2011). *Thinking with theory in qualitative research: Viewing data across multiple perspectives*. New York, NY: Routledge.

Jackson, L. (2008). Dialogic pedagogy for social justice: A critical examination. *Studies in Philosophy & Education*, *27*(2/3), 137-148.

Jacobi, T., & Becker, S. L. (2012). Rewriting Confinement: Feminist and Queer Critical Literacy in SpeakOut! Writing Workshops. *Radical Teacher, 95*(1), 32-40.

Janks, H. (2000). Domination, access, diversity and design: A synthesis for critical literacy education. *Educational review, 52*(2), 175-186.

Jett, C. (2013). Culturally responsive collegiate mathematics education: Implications for African American students. *Interdisciplinary Journal of Teaching & Learning, 3*(2), 102-116.

Johnson, J. D. (2011). Social Justice Lessons & Mathematics. *Mathematics Teaching In The Middle School, 17*(3), 174-179.

Johnson, J. D. (2012). "A rainforest in front of a bulldozer": The literacy practices of teacher candidates committed to social justice. *English Education, 44*(2), 147-179.

Johnson, E., Oppenheim, R., & Suh, Y. (2009). "Would That Be Social Justice?" A Conceptual Constellation of Social Justice Curriculum in Action. *New Educator, 5*(4), 293-310.

Jones, C. (2010). Interdisciplinary Approach: Advantages, disadvantages, and the future benefits of interdisciplinary studies. *ESSAI, 7*(1), 26.

Jones, S. (2003). Identities of race, class, and gender inside and outside the math classroom: A girls' math club as a hybrid possibility. *Feminist Teacher, 14*(3), 220-233.

Jones, S. H. & Adams, T. E. (2010). Autoethnography is a queer method. In K. Browne & C. Nash (Eds.). *Queer methods and methodologies: Intersecting queer theories and social science research* (pp. 195-214). Farnham, Surrey, England; Burlington, VT: Ashgate.

Kamberelis, G & Dimitriadis, G. (2005). Focus groups: Strategic articulations of pedagogy, politics, and inquiry. In N. Denzin & Y. Lincoln (Eds.), *The Sage handbook of qualitative research* (pp. 887-907). Thousand Oaks, CA: Sage Publications.

Karchmer, R. (2008). The journey ahead: Thirteen teachers report how the internet influences literacy and literacy instruction in their K-12 classrooms. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 1241-1280). New York, NY: Lawrence Erlbaum Associates/Taylor & Francis Group.

Keddie, A. (2012). *Educating for diversity and social justice*. New York: Routledge.

King, A. (2008). In vivo coding. In L. Given (Ed.), *The SAGE encyclopedia of qualitative research methods* (pp. 473-474). Thousand Oaks, CA: SAGE Publications, Inc.

Kosciw, J. G., Greytak, E. A., Diaz, E. M., and Bartkiewicz, M. J. (2010). *The 2009 National School Climate Survey: The experiences of lesbian, gay, bisexual and transgender youth in our nation's schools.* New York: GLSEN. Retrieved from www.glsen.org/research.

Krywanczyk, L. (2007). Queering public school pedagogy as a first-year teacher. *Radical Teacher, 79*, 27-34.

Kumashiro, K. (2001). Queer students of color and antiracist, antiheterosexist education: Paradoxes of identity and activism. In K. Kumashiro (Ed.), *Troubling intersections of race and sexuality: Queer students of color and anti-oppressive education* (pp. 1-25). Lanham, MD: Rowan & Littlefield Publishers, Inc.

Kumashiro, K. (2002). Against repetition: Addressing resistance to anti-oppressive change in the practices of learning, teaching, supervising, and researching. *Harvard Educational*

Review, 72(1), 67-92.

Kumashiro, K. (2009). Teaching teachers to teach queerly. In W. Ayers, T. Quinn, & D. Stovall (Eds.), *Handbook for social justice in education* (pp. 718-721). New York, NY: Routledge.

Lankshear, C., & Knobel, M. (2006). *New literacies: Everyday practices and classroom learning* (2nd ed.). Maidenhead, UK: Open University Press.

Ladson-Billings, G., & Tate IV, W. (1995). Toward a critical race theory of education. *The Teachers College Record*, *97*(1), 47-68.

Lawless, E. J. (1992). "I was afraid someone like you...an outsider...would misunderstand": Negotiating interpretive differences between ethnographers and subjects. *Journal of American Folklore, 105*(417), 302-314.

Lee, J. (2014, Aug. 15). Exactly How Often Do Police Shoot Unarmed Black Men? Mother Jones. Retrieved from http://www.motherjones.com/politics/2014/08/police-shootings-michael-brown-ferguson-black-men.

Lee, S. J., & Walsh, D. (2015). Teaching (In) justice: One Teacher's Work with Immigrant English Learners. *The Urban Review, 47*(1), 45-66.

Leonard, J., Brooks, W., Barnes-Johnson, J., & Berry, R. (2010). The nuances and complexities of teaching mathematics for cultural relevance and social justice. *Journal of Teacher Education, 61*(3), 261-270.

Leonard, J., & Moore, C. (2014). Learning to Enact Social Justice Pedagogy in Mathematics Classrooms. *Action in Teacher Education, 36*(1), 76-95.

Leonardo, Z. (2009). Reading whiteness: Antiracist pedagogy against white racial knowledge. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* [electronic version] (pp. 231-248). New York, NY: Routledge.

Lewis, C. & del Valle, A. (2009). Literacy and identity: Implications for research and practice. In L. Christenbury, R. Bomer, & P. Smagorinsky (Eds.), *Handbook of adolescent literacy research* (pp. 307-322). New York, NY: Guilford Press.

Lewis, C. & Fabos, B. (2008). Instant messaging, literacies, and social identities. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp.1109-1157). New York, NY: Lawrence Erlbaum Associates/Taylor & Francis Group.

Lewis, M. M. (2012). Pedagogy and the sista' professor: Teaching black queer feminist studies through the self. In E. Meiners & T. Quinn (Eds.), *Sexualities in Education: A reader* (pp. 33-40). New York, NY: Peter Lang Publishing.

Lodge, H. (1997) Providing access to academic literacy in the Arts Foundation Programme at the University of the Witwatersrand in 1996—the theory behind the practice, unpublished draft of Master's Research Report, University of the Witwatersrand.

Loutzenheiser, L. W. (1998). "If I teach about these issues they will burn down my house": The possibilities and tensions of queered, antiracist pedagogy. In K. Kumashiro (Ed.), *Troubling intersections of race and sexuality: Queer students of color and anti-oppressive education* (pp. 195-214). Lanham, MD: Rowan & Littlefield Publishers, Inc.

Loutzenheiser, L. W., & MacIntosh, L. B. (2004). Citizenships, sexualities, and education. *Theory into practice, 43*(2), 151-158.

Lowry, L. (1993). *The giver*. New York, N.Y.: Bantam Doubleday Dell Books for Young Readers.

Lucey, T., & Tanase, M. (2012). Making learning to problem-solve count critical use of mathematics to bring about social justice. *Multicultural Education, 19*(4), 8-13.

Luhmann, S. (1998). Queering/querying pedagogy? Or, pedagogy is a pretty queer thing. In W. F. Pinar (Ed.), *Queer theory in education* (pp. 141-156). Mahwah, NJ: Lawrence Erlbaum Associates.

Luke, A. (2000). Critical literacy in Australia: A matter of context and standpoint. *Journal of adolescent and adult literacy, 43*(5), 448-461.

Luke, A. (2012). Critical Literacy: Foundational Notes. *Theory into Practice, 51*(1), 4-11.

Luke, A., & Carrington, V. (2004). Globalization, literacy, curriculum practice. In T. Grainger (Ed.), The RoutledgeFalmer reader in language and literacy (pp. 52-65). London, UK: RoutledgeFalmer.

Macintosh, L. (2007). Does anyone have a band-aid? Anti-homophobia discourses and pedagogical impossibilities. *Educational Studies, 41*(1), 33-43.

Madison, D. (2012). *Critical ethnography: Method, ethics, and performance* (2nd ed.). Thousand Oaks, CA: Sage.

Marshall, J. P. (2008). Gender in online communication. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 491-519). New York, NY: Lawrence Erlbaum Associates/Taylor & Francis Group.

Martino, W. (2009). Literacy issues and GLBTQ youth: Queer interventions in English education. In L. Christenbury, R. Bomer, & P. Smagorinsky (Eds.) *Handbook of adolescent literacy research* (pp. 386-399). New York, NY: Guilford Press.

Martino, W., & Cumming-Potvin, W. (2011). "They Didn't Have Out There Gay Parents—They Just Looked Like Normal Regular Parents": Investigating Teachers' Approaches to Addressing Same-Sex Parenting and Non-normative Sexuality in the Elementary School Classroom. *Curriculum Inquiry, 41*(4), 480-501.

Mather, K. & Winton, R. (2014, May 24). Isla Vista shooting suspect vowed 'war on women,' sorority. *LA Times*. Retrieved from www.latimes.com.

Mayo, C. (2007). Intermittently Queer. In N. Rodriquez & W. Pinar (Eds.), *Queering straight teachers: Discourse and identity in education* (pp. 183-200). New York, NY: Peter Lang.

McDonald, M. A. (2005). The integration of social justice in teacher education: Dimensions of prospective teachers' opportunities to learn. *Journal of Teacher Education, 56*(5), 418-435.

McGee Banks, C. A., & Banks, J. A. (1995). Equity pedagogy: An essential component of multicultural education. *Theory into practice, 34*(3), 152-158.

McGee, E. O., & Hostetler, A. L. (2014). Historicizing mathematics and mathematizing social studies for social justice: A call for integration. *Equity & Excellence in Education, 47*(2), 208-229.

McLaughlin, M. & DeVoogd, G. (2011). Critical literacy as comprehension: Understanding at deeper levels. In D. Lapp & D. Fisher (Eds.), *Handbook of research on teaching the English language arts* (3rd ed.) (pp. 278-282). New York, NY: Routledge.

Mendick, H. (2006). *Masculinities in mathematics*. London: McGraw-Hill Education (UK).

Meyer, E. J. (2007). "But I'm not gay": What straight teachers need to know about queer theory. In N. M. Rodriguez & W. F. Pinar (Eds.), *Queering straight teachers: Discourse and identity in education* (pp. 15-32). New York, NY: Peter Lang.

Miller, J. L. (1998). Autobiography as a queer curriculum practice. In W. F. Pinar (Ed.), *Queer theory in education* (pp. 365-373). Mahwah, NJ: Lawrence Erlbaum Associates.

Miller, s. j. (2008). Introduction: Fourthspace- Revisiting social justice in Teacher education. In s. j. Miller, L. B. Beliveau, T. DeStigter, D. Kirkland & P. Rice (Eds.), *Narratives of social justice teaching: How English teachers negotiate theory and practice between preservice and inservice spaces* (Vol. 332), (pp. 1-21). New York, NY: Peter Lang.

Miller, s. j. (2010). Theoretical roots of social justice: A literature review. In s.j. Miller& D. E. Kirkland (Eds.), *Change matters: Critical essays on moving social justice research from theory to policy* (pp. 25-32). New York, NY: Peter Lang.

Miller, s .j., Wilson-Segura, C., & Lorenzo, K. (2008). Multicultural spaces meet rural places. In s.j. Miller, L. B. Beliveau, T. DeStigter, D. Kirkland & P. Rice (Eds.) *Narratives of social justice teaching: How English teachers negotiate theory and practice between preservice and inservice spaces* (Vol. 332), (pp. 87-120). New York, NY: Peter Lang.

Mitescu, E., Pedulla, J., Cannady, M., Cochran-Smith, M., & Jong, C. (2011). Measuring Practices of Teaching for Social Justice in Elementary Mathematics Classrooms. *Educational Research Quarterly, 34*(3), 15-39.

Moje, E. B. (2007). Developing socially just subject-matter instruction: A review of the literature on disciplinary literacy teaching. *Review of research in education, 31*(1), 1-44.

Moll, L., Amanti, C., Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory into Practice, 31*(2), 132-141.

Moses, R., West, M. M., & Davis, F. E. (2009). Culturally responsive mathematics education in the algebra project. In Greer, B., Mukhopadhyay, S., Powell, A. B., & Nelson-Barber, S. (Eds.), *Culturally responsive mathematics education* (pp. 239-256). New York, NY: Routledge.

Mosley, M. & Finders, M. (2009). Shared leadership, adolescent literacies, and social justice education in the "third space." In R. Rogers, M. A. Kramer, M. Mosley & Literacy for Social Justice Teacher Research Group (Eds.), *Designing socially just learning*

communities: Critical literacy education across the lifespan (pp. 101-112). New York, NY: Routledge.

Muñoz, J. E. (2007). Cruising the toilet: LeRoi Jones/Amiri Baraka, radical black traditions, and queer futurity. *GLQ: A Journal of Lesbian and Gay Studies*, *13*(2), 353-367.

Myers, J., & Beach, R. (2001). Hypermedia authoring as critical literacy. *Journal of Adolescent and Adult Literacy, 44*(6), 538-547.

Myers, J., & Eberfors, F. (2010). Globalizing English through intercultural critical literacy. *English Education, 42*(2), 148-170.

Myers, J., Hammett, R., & McKillop, A. N. (1998). Electronic symbol making: Young children's computer related emerging concepts about literacy. In D. Reinking, M. C. McKenna, L. D. Labbo, & R. D. Kieffer's (Eds), *Handbook of literacy and technology: Transformations in a post-typographic world* (pp. 63-78). Mahwah, N.J.: L Erlbaum Associates.

Nath, S., & Szücs, D. (2014). Construction play and cognitive skills associated with the development of mathematical abilities in 7-year-old children. *Learning and Instruction, 32*, 73-80.

Nixon, H, Atkinson, S. & Beavis, C. (2006). New media pathways: Navigating the links between home, school, and the workplace. In L. Tan, W. Hin, & R. Subramaniam (Eds.), *Handbook of research on literacy in technology at the K-12 level* (pp. 118-136). Hershey, PA: Idea Group Reference.

Noblit, G. W., Flores, S. Y. & Murillo, E. G. (Eds.) (2004). *Postcritical ethnography: Reinscribing critique.* Cresskill, NJ: Hampton Press.

North, C. E. (2009). *Teaching for social justice?: Voices from the front lines*. Boulder, CO: Paradigm Publishers.

Oakes, J., & Lipton, M. (2003). *Teaching to change the world*. Boston, MA: McGraw-Hill.

O'Loughlin, M. and Taylor, P. (2014). Becoming revolutionaries: Toward non-teleological and non-normative notions of youth growth. In A. Ibrahim & S. Steinberg (Eds.), *Critical Youth Studies Reader* (pp. 47-57). New York, NY: Peter Lang.

Oster, L. (2001). Using the think-aloud for reading instruction. *The Reading Teacher, 55*(1), 64-69.

Parks, A. N., & Blom, D. C. (2014). Helping Young Children See Math in Play. *Teaching Children Mathematics, 20*(5), 310-317.

Patel Stevens, L. & Bean, T. (2007). *Critical literacy: Context, research, and practice in the K-12 classroom.* Thousand Oaks, CA: Sage Publications.

Payne, E., & Smith, M. (2010). Reduction of stigma in schools: An evaluation of the first three years. *Issues in Teacher Education, 19*(2), 11-36.

Puar, J. K. (2007). *Terrorist assemblages: Homonationalism in queer times*. Durham, NC: Duke University Press.

Pescatore, C. (2007). Current events as empowering literacy: For English and social studies teachers. *Journal of Adolescent & Adult Literacy, 51*(4), 326-339.

Plummer, K. (2005). Critical humanism and queer theory. In N. Denzin & Y. Lincoln (Eds.) *The Sage handbook of qualitative research* (pp. 357-373). Thousand Oaks, CA: Sage Publications.

Quinlivan, K., & Town, S. (1999). Queer pedagogy, educational practice and lesbian and gay youth. *International Journal of Qualitative Studies in Education, 12*(5), 509-524.

Rands, K. (2009). Mathematical Inqu[ee]ry: beyond 'Add-Queers-and-Stir' elementary mathematics education. *Sex Education, 9*(2), 181-191.

Rendón, L. I. (2009). *Sentipensante (sensing/thinking) pedagogy: Educating for wholeness, social justice and liberation* (1st ed.). Sterling, Va.: Stylus Pub.

Reynolds, M. (2009). Keeping it real. In D. Stovall, T. Quinn & W. Ayers (Eds.) *Handbook of Social Justice in Education* [electronic version] (pp. 681-684). New York, NY: Routledge.

Rhodes, J. A. & Robnalt, V. J. (2009). Digital literacies in the classroom. In L. Christenbury, R. Bomer, & P. Smagorinsky (Eds.), *Handbook of adolescent literacy research* (pp. 153-169). New York, NY: Guilford Press.

Rogers, R. (2002). "That's what you're here for, you're supposed to tell us": Teaching and learning critical literacy. *Journal of Adolescent & Adult Literacy, 45*(8), 772-787.

Root, R. (2009). Social justice through quantitative literacy: A course connecting numeracy, engaged citizenship, and a just society. *Democracy & Education, 18*(3), 37-43.

Ruffolo, D. (2007). From teacher knowledge to queered teacher knowledge research: Escaping the epistemic straight jacket. In N. Rodriquez & W. Pinar (Eds.), *Queering straight teachers: Discourse and identity in education* (pp. 255-276). New York, NY: Peter Lang.

Sadowski, M. (2010). Core values and the identity-supportive classroom: Setting LGBTQ issues within wider frameworks for preservice educators. *Issues in Teacher Education, 19*(2), 53-62.

Sanchez, J. (2013, Oct. 17). "Atlanta Braves fans don't respond well to GLAAD Spirit Day Facebook Post." Retrieved from http://fansided.com/2013/10/17/atlanta-braves-fans-dont-respond-well-glaad-spirit-day-facebook-post/.

Sandholtz, J. H. (2000). Interdisciplinary team teaching as a form of professional development. *Teacher Education Quarterly*, 39-54.

Sarigianides, S. T. (2012). Tensions in teaching adolescence/ts: Analyzing resistances in a Young Adult literature course. *Journal of Adolescent & Adult Literacy, 56*(3), 222-230.

Schippert, C. (2006). Critical projection and queer performativity: Self-revelation in teaching/learning otherness. *Review of Education, Pedagogy & Cultural Studies, 28*(3/4), 281-295.

Schmar-Dobler, E. (2003). Reading on the Internet: The link between literacy and technology. *Journal of adolescent & adult literacy*, *47*(1), 80-85.

Searle, J. (2009). Renaming the moon: Learning English in middle school. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* [electronic version], (pp. 685-6). New York: Routledge.

Sears, J. (Ed.). (2003). Gay, lesbian, and transgender issues in education: Programs, policies, and practices. New York: Routledge.

Selber, S. A. (2004). *Multiliteracies for a digital age*. Carbondale: Southern Illinois University Press.

Simmons, A. M. (2012). Class on fire: Using the Hunger Games trilogy to encourage social action. *Journal of Adolescent & Adult Literacy, 56*(1), 22-34.

Skerrett, A. (2010). Teaching critical literacy for social justice. *Action in Teacher Education, 31*(4), 54-65.

Skovsmose, O. (1994). Towards a critical mathematics education. *Educational Studies in Mathematics, 27*(1), 35-57.

Spurlin, W. J. (2000). *Lesbian and gay studies and the teaching of English: Positions, pedagogies, and cultural politics*. Urbana, IL: National Council of Teachers of English.

Stinson, D. W., Bidwell, C. R., & Powell, G. C. (2012). Critical pedagogy and teaching mathematics for social justice. *International Journal of Critical Pedagogy, 4*(1), 76-94.

Stern, D. (1998). Teaching for change. In W. Ayers, J. A. Hunt, and T. Quinn (Eds.), *Teaching for social justice: A democracy and education reader* (pp. 276-284). New York, NY: Teachers College Press, The New Press.

Street, B. V. (1995). *Social literacies: Critical approaches to literacy in development, ethnography and education*. London; New York, NY: Longman.

Stylianou-Georgiou, A., Vrasidas, C., Christodoulou, N., Zembylas, M., & Landone, E. (2006). Technologies challenging literacy: Hypertext, community building, reflection and critical literacy. In L. Tan, W. Hin, & R. Subramaniam (Eds.), *Handbook of research on literacy in technology at the K-12 level* (pp. 21-33). Hershey, PA: Idea Group Reference.

Sumara, D., & Davis, B. (1999). Interrupting heteronormativity: Toward a queer curriculum theory. *Curriculum Inquiry, 29*(2), 191-208.

Swalwell, K. (2013). "With great power comes great responsibility:" Privileged students' conceptions of justice-oriented citizenship. *Democracy & Education, 21*(1), 1-11.

Sykes, H. (2011). Hetero-and Homo-Normativity: Critical Literacy, Citizenship Education and Queer Theory. *Curriculum Inquiry, 41*(4), 419-432.

Talburt, S. (1999). Open secrets and problems of queer ethnography: Readings from a religious studies classroom. *International Journal of Qualitative Studies in Education, 12*(5), 525-539.

Talburt, S. (2009). Toys, pleasures, and the future. In R. DePalma & E. Atkinson (Eds.), *Interrogating heteronormativity in primary schools: The work of the No Outsiders Project.* Trentham, UK: Stoke on Trentham.

Tan, L. (2009). The 5 E's of emancipatory pedagogy: The rehumanizing approach to teaching and learning with inner-city youth. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* [electronic version], (pp. 485-496). New York, NY: Routledge.

Terry, C. (2010). Prisons, Pipelines, and the President: Developing Critical Math Literacy through Participatory Action Research. *Journal Of African American Males In Education, 1*(2), 73-104.

The New London Group (1996). A pedagogy of multiliteracies: Designing social futures. *Harvard Educational Review, 66*(1), 60-92.

Thomas, A. (2008). Community, culture, and citizenship in cyberspace. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 671-698). New York, NY: Lawrence Erlbaum Associates/Taylor & Francis Group.

Thomas, A. (2013). Youth participation: Learning and growth in the forum. In C. Lankshear & M. Knobel (Eds.), *A new literacies reader: Educational perspectives* (pp. 267-281). New York, NY: Peter Lang.

Thomas, P. L., Hall, L. A., & Piazza, S. V. (2010). Challenging Texts: Engaging with Critical Literacy: Reflections on Teaching and Learning. *English Journal, 99*(5), 91-94.

Tirmizi, A., Unsicker, J., Khan, M., Solomon, M. & Williams, K. (n.d.). Leadership for Social Justice: Capacity-Building Resource Manual. Brattleboro, VT: School for International Training, World Learning. Retrieved from http://www.sit.edu/SITOccasionalPapers/lsj_resource_manual.pdf.

Turner, W. B. (2000). *A genealogy of queer theory*. Philadelphia, PA: Temple University Press.

Ukpokodu, O. N. (2011). How do I teach mathematics in a culturally responsive way? Identifying empowering teaching practices. *Multicultural Education, 18*(3), 47-56.

Unsworth, L. (2008). Multiliteracies and metalanguage: Describing image/text relations as a resource for negotiating multimodal texts. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 377-405). New York:, NY Lawrence Erlbaum Associates/Taylor & Francis Group.

Urrieta, L. (2009). *Working from within: Chicana and Chicano activist educators in whitestream Schools.* Tucson, AZ: University of Arizona Press.

Vanderburg, R. (2009). Challenging Texts: How Teaching" Middlesex" Challenged Students' Paradigms. *English Journal*, *98*(3), 103-105.

Vasudevan, L., DeJanes, T., & Schmier, S. (2010). Multimodal pedagogies: Playing, teaching and learning with adolescents' digital literacies. In D. E. Alvermann (Ed.), *Adolescents' online literacies: Connecting classrooms, digital media, and popular culture* (pp. 5-26). New York, NY: Peter Lang.

Wargo, J. M. (2014, April). #donttagyourhate: Sexual subjectivities, writing as reparation, and the on-/offline queer politics of everyday life. Paper presented at the annual meeting of the American Educational Research Association (AERA) in Philadelphia, PA.

Warnick, B. (2002). *Critical literacy in a digital era: Technology, rhetoric, and the public interest*. Mahwah, N.J.: Lawrence Erlbaum Associates.

Warnick, B. R., & Stemhagen, K. (2007). Mathematics teachers as moral educators: the implications of conceiving of mathematics as a technology. *Journal of Curriculum Studies, 39*(3), 303-316.

Weems, L. (2007). Un/Fixing the fiend: Queering pedagogy and dangerous desires. *Educational Studies, 41*(3), 194-211.

Westheimer, J. & Kahne, J. (1998). Education for action: Preparing youth for participatory democracy. In W. Ayers, J. A. Hunt, and T. Quinn (Eds.), *Teaching for social justice: A democracy and education reader* (pp. 1-20). New York, NY: Teachers College Press, The New Press.

Whitin, D. J., & Whitin, P. (2011). *Learning to read the numbers: Integrating critical literacy and critical numeracy in K-8 Classrooms*. New York, NY: Routledge.

Whitlock, R. (2010). Getting queer: Teacher education, gender studies, and the cross-disciplinary quest for queer pedagogies. *Issues in Teacher Education, 19*(2), 81-104.

Wiest, L. R., Higgins, H. J., & Frost, J. (2007). Quantitative literacy for social justice. *Equity & Excellence in Education, 40*(1), 47-55.

Winans, A. (2006). Queering pedagogy in the English classroom: Engaging with the places where thinking stops. *Pedagogy: Critical Approaches to Teaching Literature, Language, Composition, and Culture, 6*(1), 103-122.

Wohlwend, K. & Lewis, C. (2011). Critical literacy, critical engagement, and digital technology: Convergence and embodiment in glocal spheres. In D Lapp & D. Fisher (Eds.), *Handbook of research on teaching the English language arts* (3rd ed.), (pp. 188-194). New York, NY: Routledge.

Wolcott, H. F. (1973). *The man in the principal's office: An ethnography*. Lanham, MD: Rowman Altamira.

Wolfgang, C. H., & Phelps, P. (1983). Preschool play materials preference inventory. *Early child development and care, 12*(2), 127-141.

Wolk, S. (2009). Reading for a better world: Teaching for social responsibility with young adult literature. *Journal of Adolescent & Adult Literacy, 52*(8), 664-673.

Wyatt-Smith, C. & Elkins, J. (2008). Multimodal reading and comprehension in online environments. In J. Coiro, M. Knobel, C. Lankshear, & D. Leu (Eds.), *Handbook of research on new literacies* (pp. 899-940). New York, NY: Lawrence Erlbaum Associates/Taylor & Francis Group.

Yang, K. W. (2009). For and against: The school-education dialect in social justice. In D. Stovall, T. Quinn & W. Ayers (Eds.), *Handbook of Social Justice in Education* [electronic version] (pp. 455-464). New York, NY: Routledge.

Yip, G. (2008, March 27). Stuff lesbians like part 15: Processing. [Blog Post]. Retrieved from http://gracethespot.com/?p=162.

Young, S. L. B. (2009). Breaking the silence: Critical literacy and social action. *English Journal, 98*(4), 109-115.

Zeichner, K. M. (2009). *Teacher education and the struggle for social justice*. New York, NY: Routledge.

Zembylas, M., & Vrasidas, C. (2005). Globalization, information and communication technologies, and the prospect of a 'global village': promises of inclusion or electronic colonization? *Journal of Curriculum Studies, 37*(1), 65-83. doi: 10.1080/0022027032000190687.